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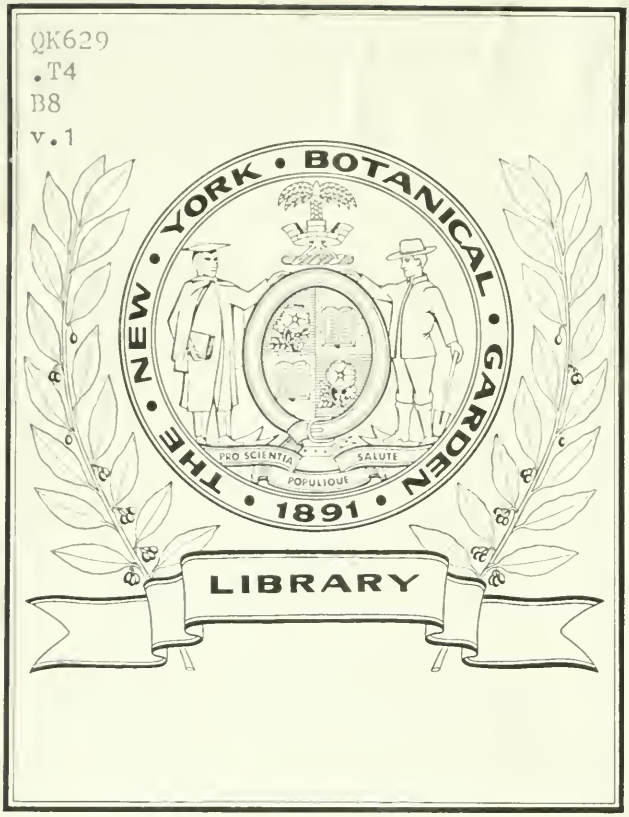

The Thelephoraceae of North America. I

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THE THELEPHORACEÆ OF NORTH AMERICA. I[1]

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Introduction

This monographic study of the North American *Thelephoraceæ* was begun in 1894 as the author's contribution towards a greatly needed manual of the *Basidiomycetes* of the United States,—a need that still confronts us. It has been necessary to carry on these investigations in connection with college and other work which required most of my time, but the long period covered has been an advantage; for during these two decades there has been such widespread interest in the *Thelephoraceæ* on the part of American students of fungi that it has been possible to study this family and its distribution from extensive series of freshly collected specimens from all the important regions of North America with the exception of Alaska, Mexico, and the Colorado-New Mexico region of the United States, from which but small collections have been received. These specimens have been preserved unpoisoned in my herbarium in insect-proof tin boxes which receive herbarium sheets, and each will be cited by the number or other designation adopted by my correspondents in order that their specimens may be as useful for future reference as my own. The quantity of material always awaiting examination has confined my work to a systematic treatment of this family.

Except in the case of types of species, specimens of published exsiccati, and the specimens of Schweinitz's herbarium, I cite but few specimens from the large herbaria. This is done on account of the difficulty and large amount of time involved in making a study of the material contained in them. Serious changes in the condition of the specimens in these herbaria have been occasioned partly by time but more largely by the poisonous solutions with which the specimens were soaked for preservation under old-fashioned methods of herbarium procedure,—

[1] Issued July 1, 1914.

methods well enough adapted for flowering plants but not for fungi.

Early in the work it became apparent that the diagnoses of known species of resupinate *Thelephoraceæ* had failed utterly to enable the leading working mycologists of any country to recognize with certainty in the species about them those described in other countries, or those described for their own country by earlier students. The truth of this statement is shown by the errors and confusion in names of the common species which have been distributed in exsiccati, by the fact that in the large herbaria several different species are likely to bear the same specific name on the same or successive sheets, and by the vastly more important fact that the masters of mycology of each age, when relying wholly on the diagnoses published by their contemporaries or predecessors, have described as new species common and conspicuous resupinate fungi which had been accurately described by immediate contemporaries or predecessors, and in very many cases just as accurately by still earlier students. All the mycologists concerned in these redescriptions have been earnest strivers after truth, I am convinced, and would have preferred to employ the earlier names for their plants, could they have known that those earlier names referred with certainty to their specimens. All these people were relying, as was the usage of their time, on a few words of published description in some other than their mother tongue.

It is time to recognize generally that the resupinate *Hymenomycetes*, and especially the *Thelephoraceæ*, are extremely difficult taxonomic problems. Descriptions must include more than a rather vague and generalized characterization of the mere superficial appearance and habit of the specimen with possibly a reference to spores which some one recorded for what was perhaps this species. The fungus itself is an individual of the species; the description in words and by illustration has merit in proportion to the success it has in producing in the mind of any educated stranger exactly the ideas which he could derive from the study in detail of the specimen itself. From the specimen, exact ideas may be had of coloration, of form, of dimensions, of texture, of consistency, of internal structure, of organs of minute size, of place of growth, and of host and

substratum. If the description fails to give the color as exactly as if it had been noted by comparison with such a standard work as Ridgway's 'Color Standards' or Saccardo's 'Chromotaxia,' then it is inferior to the specimen; if the description contains no information as to whether the basidia are simple or cruciate, making up the whole hymenium or arranged side by side with other organs of characteristic form, standing directly on the substratum or separated from it by densely or loosely interwoven hyphæ or other form of subhymenial layer;—if it does not contain all this information in exact terms and as much in addition as the specimen itself could afford, then it is an imperfect description of the species. It may be so imperfect that a dozen different species of fungi could be assembled, to any one of which it would apply as well as to any other, as is the case with the supposedly common and cosmopolitan *Corticium lacteum* and *C. calceum*. Published exsiccati probably contain the full dozen under each of these names.

In the case of resupinate *Hymenomycetes*, types and authentic specimens of the species are of the highest importance to supplement the prevailingly imperfect descriptions with full and exact data. Hence, the types of fungi on which the descriptions are based and the authentic specimens from the authors of the species are of importance in proportion to the degree in which these plants may yield data not afforded by the descriptions and existing illustrations of the species. In the case of the resupinate *Hymenomycetes*, the early descriptions are of slight practical value except as they are backed up by types and specimens from their authors. For this reason, if there had been no other, the International Botanical Congress, at Brussels, acted for the best interests of mycology in fixing the beginning of the naming of *Hymenomycetes* with the publication of Fries' 'Systema Mycologicum,'—the time when the preservation of types and authentic specimens of such fungi in herbaria became so prevalent that it was possible for later mycologists to distinguish the resupinate species by taking the trouble to study the types, if authentic specimens could not be obtained.

My method of becoming acquainted with our described species of *Thelephoraceæ* has been to study and arrange by species in my herbarium the specimens as they have accumu-

lated. In this arrangement due regard has been given to original descriptions of species and to all details of internal structure. Spore collections on glass slides have been made for each species whenever possible, and about five thousand mounts of sectional preparations in glycerin have been made from collections and preserved for reference in connection with internal structure of the specimens. From time to time I have taken my *Thelephoraceæ* to herbaria where the types of our American species are stored and have there painstakingly matched them with the types. I have made sectional preparations from a fragment of each of these types in order to make sure that my specimens match the types not only in external characters but also in all details of internal structure. The sectional preparations of type specimens have been preserved in glycerin. Specimens from my herbarium which have been so matched with type specimens have been used by me later for the determinations of subsequent collections. Such methods of investigation are probably too laborious and require too much time to become popular and they afford little opportunity for the inspirational flights attributed to genius, but they do afford a means of determining within very narrow limits the species of North American *Thelephoraceæ*.

I am under especial obligation to Dr. W. G. Farlow for suggesting this work, for interest in its progress, and for frequent access to the Curtis Herbarium for comparisons with types. I am indebted also to Dr. C. H. Peck for opportunity to study his types in the New York State Herbarium, to the late Dr. L. M. Underwood for similar opportunity with the Ellis types in the Herbarium of the New York Botanical Garden, to Dr. S. W. Dixon and Professor S. Brown, of the Philadelphia Academy of Natural Sciences, for the privilege of studying in the Schweinitz Herbarium, to Sir W. T. Thistleton-Dyer and Mr. G. Massee for access to types and authentic specimens in Kew Herbarium, to the late Dr. T. M. Fries for the privilege of studying in the Herbarium of Elias Fries, at Upsala, and to Mr. Lars Romell, of Stockholm, Dr. P. A. Karsten, of Mustiala, and Abate G. Bresadola, of Trient, for many authentic specimens of their own species and for specimens which they had compared with types of early authors of *Thelephoraceæ* of

Europe. In the later pages names of the many botanists who have participated in this work by the contribution of specimens from their respective regions are given in connection with the specimens. I feel my obligation to each of these correspondents.

Having become thoroughly familiar with the species of a family of fungi, one then faces the task of deciding under what genera they shall be grouped in order that others may more easily recognize them. Our studies in systematic botany and the accumulations of plants in herbaria are primarily for the purpose of enabling those who wish to obtain information about any particular plant, however obscure, to determine its name accurately and so be in a position to get at the world's literature and knowledge concerning that species; and also to enable botanists so to entitle and index their researches that the results will be more available to the world at large. Stability in the nomenclature of plants is therefore important, and revolutionary changes in generic conceptions should not be lightly and frequently made. Whenever one proposes new genera to supersede a well-established genus which has satisfactorily embraced the related species of the world, the burden of proof should be on the one who makes the change to demonstrate that the advantages from the innovation will more than compensate for the confusion which would result as well as for the loss of knowledge indexed under the superseded name.

Many new genera of fungi have been proposed during recent years. These have frequently come from students with a limited knowledge of the species of the world. It is not surprising that a botanist working on the few species of a limited region should be led to the establishment of new genera on the basis of what seem to be sharp differences in his species or groups of species. When, however, his knowledge encompasses just as definitely the structure of the many species of some large portion of the world, his perspective changes, and he may now find that the species which he formerly regarded as generically distinct are so closely connected by intermediate species that the contemplated generic separation would be unnatural and a hindrance to botanical progress. It is fundamental that genera be so sharply defined that any accurate observer who will make

the study necessary for the application of the generic definition may be sure ninety-nine times out of a hundred that the fungus on which he is working is a *Stereum*, for example, and not a *Thelephora*, nor a *Craterellus*, nor a *Cladoderris*, nor a *Corticium*, nor a *Peniophora*, nor a *Sebacina*. It is an obligation on authors to group their species so accurately under genera that *Stereum*, for example, shall comprise all the species of this genus known to science, and no others. The synonomy of species in later pages will show how vaguely the genera of *Thelephoraceæ* have been comprehended.

It is desirable that a genus should consist of but few species in those cases where the group is sharply and naturally set off from others, that is, where no intermediate species connect the genus with other groups. While such small genera are desirable, if wholly natural, it is in the highest degree objectionable to create small artificial genera by arbitrarily segregating the species of a natural genus and so establishing indefinite lines of demarkation between genera. Under such a procedure the generic location of certain species becomes wholly arbitrary and always continues as a stumbling block for new students and this leads to the loading of our literature with so-called new species. A case in point is Saccardo's scheme in the 'Sylloge Fungorum' in which he separates *Hypochnus* from *Corticium* and *Peniophora* without any natural generic planes of cleavage. In practical work one needs to know exactly what the generic limits of *Corticium*, *Peniophora*, and *Hypochnus* are. The question naturally arises as to just how loose and open the structure of the fructification must be to be included in the genus *Hypochnus* rather than in *Corticium* or *Peniophora*. Henning's violation of the principle involved is still more flagrant, for he separated the *Hypochnaceæ* as a new family from the *Thelephoraceæ*[1] and placed *Hypochnus* of Saccardo in the *Hypochnaceæ*, and *Corticium* and *Peniophora* in the *Thelephoraceæ*. As all students of the *Thelephoraceæ* have found *Hypochnus*, as understood by Saccardo, wholly unworkable, it would increase the usefulness of the 'Sylloge Fungorum' if Saccardo were to distribute among *Corticium* and *Peniophora*, the species which he now includes under *Hypochnus*.

[1]Engler und Prantl, Nat. Pflanzenfam. (I. 1**): 114. 1898.

Probably all species of *Corticium*, as originally understood, have an hymenium composed of basidia arranged side by side between non-sporebearing organs termed paraphyses. In many species, it is difficult to distinguish between the basidia and the paraphyses except by prolonged study of special preparations or by observations made at the time the basidia bear spores. In other species the sterile organs are conspicuous and distinct from the basidia either by their larger size, different form, or thicker or incrusted walls. Such conspicuous bodies are called cystidia, but if the paraphyses are merely finely but characteristically branched near their tips, they are not called cystidia. Such branched paraphyses occur in the hymenium of occasional species of several genera of the *Thelephoraceæ* and are valuable characters for specific diagnosis.

In 1880, Cooke proposed, from Kew Herbarium, to divide the old genus *Corticium* into two genera,—the name *Corticium* to be retained for those species having the non-sporebearing organs of the hymenium not distinguishable from the basidia, and the generic name *Peniophora* to be given to those species having cystidia. As the species of *Corticium* were very numerous and extremely difficult taxonomically, this proposal was hopefully received, and for more than thirty years the transfer of species from *Corticium* to *Peniophora* has been going on and the end has not been reached yet. During this long period there has been confusion as to which species of the old genus *Corticium* belong in the emended *Corticium* and which in the genus *Peniophora*.

Peniophora is an artificial rather than a natural genus, however, and its adoption has given to many species a position intermediate between this genus and *Corticium*. These intermediate species have to be classed with the one genus or the other according to personal judgment, for no one can state just how conspicuous the sterile organs must be, nor of how constant occurrence, to merit the name cystidia. In *Corticium Sambuci* Fr., for example, cystidia are readily found in preparations from some collections, but several preparations may have to be made to demonstrate them in other collections. In the same species and in different parts of the same section, cystidia may sometimes be sparingly and sometimes not at all incrusted. Some

species which I have placed in the genus *Peniophora* because of the presence of cystidia students may look for under *Corticium* when, by a more hasty study of their collections, they fail to detect these organs. On the other hand, students using more discriminating methods than mine may detect cystidia in species in which I have overlooked them, and such students will search in *Peniophora* for species which I have placed under *Corticium*. Species intermediate between genera always cause such trouble. There are many intermediates between *Peniophora* and *Corticium*, yet in this particular case the advantage from the separation undoubtedly more than compensates for the disadvantages occasioned by the intermediate species.

The case of *Peniophora* has been considered at length, because this genus is being regarded as a precedent for subdividing *Stereum* and grouping under *Lloydella* all those species which have conspicuous non-sporebearing organs between the basidia. Such a separation, however, would be artificial and give rise to a troublesome series of intermediate species, without the compensating advantage which accrued in the case of *Peniophora* and *Corticium*. *Stereum* is not a genus of difficult species nor does it comprise an immense number of species. It is just a fine, natural group of species capable of being more sharply defined than it was by Fries, so as to receive some species from *Thelephora* of Fries and to part with some to *Corticium*. So defined, even beginners will have no trouble in recognizing species of *Stereum*. Systematic work in mycology should strive to establish and maintain just such natural, clean-cut genera as *Stereum*.

It seems to me best to work along constructive rather than destructive lines. Fries had a wonderful ability for the perception of the natural grouping of fungi on the basis of gross morphology and habit. Since his time, research has greatly enlarged the knowledge of the internal structure of fungi and of the organs of propagation. The value of such organs in the classification of seed plants is well known. It is feasible to modify somewhat the genera of *Thelephoraceæ* as defined by Fries, in accordance with the true relationships and differences shown by the present knowledge of internal structure, basidia, and spores, and a system results which is the natural evolution of taxonomic and morphologic study of *Thelephoraceæ*. This

system has been communicated to my correspondents in connection with specimens. Its principal features are:

1. To restrict *Thelephora* to pileate species with simple basidia and colored spores.
2. To follow Karsten and Bresadola in placing under *Hypochnus* only resupinate species with colored echinulate spores.
3. To restrict *Stereum* to pileate species which have simple basidia and colorless spores and lack setæ in the hymenium.
4. To include in *Hymenochæte* all species having setæ.
5. To include in *Corticium* species always resupinate, which have colorless spores and lack cystidia, excepting those species which for other reasons are placed in *Exobasidium*. Include in *Corticium* hypochnoid as well as compact species.
6. To include in *Peniophora* all species which differ from *Corticium* merely by the presence of cystidia.

I find this system workable and very satisfactory for the accurate location of species in genera, except in the case of the species intermediate between *Peniophora* and *Corticium*. The proposals to subdivide *Peniophora* into *Glœocystidium*, *Peniophorella*, *Glœopeniophora*, etc., would create large numbers of species intermediate between the new genera, without compensating advantages.

I have studied the species of my predecessors and co-workers sympathetically and have endeavored to find real differences between their species and those previously known so that the validity of theirs might be confirmed. The great area of land covered by the present work, the differences in climate and substratum, and the keen search by my correspondents have brought to hand a very large number of specimens. I have earnestly striven to place them under species already known, but it has been necessary to describe many as new. I regret that there are so many of these. Should any one have reason to believe that in any case I have described as new a species already known, I shall esteem it a favor to receive an authentic specimen of the older species or to be informed where such a specimen can be consulted.

Colors of specimens were noted and recorded during the first years of my work by comparison with Saccardo's 'Chromotaxia' in accordance with his descriptive terms. Recently I have been using Ridgway's 'Color Standards and Nomenclature,' 1912, which has a greater variety of colors useful in the characterization of the species of *Thelephoraceæ*.

In my own work with collections of living fungi I am endeavoring to gather for each species a spore collection on a glass slip. The spores adhere well so that they may be covered by paper and preserved in the envelope with the dried specimens from which the spores were obtained. Such collections give the exact color and dimensions of mature spores. These dimensions are generally rather larger than those obtained from spores of sectional preparations of dried herbarium specimens. The spores of dried specimens, i. e., those remaining attached to the specimens, are probably too immature to be of normal size, and sometimes there are so few of them that one must exercise caution to avoid errors due to the study of spores foreign to the fungus.

Latex exists in many species of several of the genera and is more abundant and conspicuous in some species than in others, and its containing elements often extend to the hymenial surface. When specimens are in the vegetative condition, injury to the hymenium may liberate the fluid contents of the latex bodies so that this fluid exudes in colored drops at the edges of the wound, or discolors the bruised surface. For many of our species there is a lack of data concerning the color of this fluid or the discoloration. The latex bodies are pale brown in microscopic preparations made by my methods and must not be confused with setæ or cystidia. Latex is well shown in *Stereum spadiceum*, *S. sanguinolentum*, and *Corticium lactescens*.

There has been a disposition on the part of some authors to regard the *Thelephoraceæ* as not sharply separated from the *Hyphomycetes*. The specimens which I have collected, in striving to find all the *Thelephoraceæ* of my collecting region, and the specimens received from my correspondents afford no embarrassment in recognizing the most hypochnoid species of *Thelephoraceæ* by the basidia which characterize the families of *Hymenomycetes* in general.

The microscopical technique has been simplified as much as possible. Usually dried herbarium material had to be used for study and proved very satisfactory except in the case of specimens which had been subjected to poisoning processes for preservation in herbaria. A small bit of the fructification having a promising hymenial surface 2 or 3mm. square—but smaller if the specimen is a valuable type—is first moistened with alcohol, then wet with water and cut out from the rest of the specimen and from the substratum. This bit is then placed in a holder of elder pith and oriented so that the sections may be cut perpendicular to the surface of the hymenium and also contain as long hyphæ as possible. The sections are cut as thin as possible, free hand, with a very keen section razor flooded with alcohol. The thinnest sections are placed on a slide in a drop of water and then a drop of seven per cent aqueous solution of potassium hydrate is added.

Close observation of the sections should be made when the potassium hydrate solution comes in contact with them. For most species, the sections are merely cleared and the hyphæ swelled to the normal size of vegetative hyphæ. In a few species, the alkaline solution may dissolve out the color of the section on coming in contact with it, or it may change this color to a violet, which finally disappears, or it may cause disorganization changes in certain structures leading to their disappearance or destruction. Such changes should be observed and noted, for they are of help in the determination of the species. In the cases in which potassium hydrate solution exerts a destructive action, lactic acid should be employed with other sections in the manner described for potassium hydrate. Lactic acid clears and swells sections well, but so much more slowly than potassium hydrate that I have used it only where the latter is not satisfactory. After the sections have been cleared, the potassium hydrate should be drained off, the sections lightly stained on the slide with alcoholic solution of eosin (but not overstained), mounted in water, and studied at once.

For a thorough study of the species of the family at least one permanent preparation of each species should be retained for future comparisons. Permanent preparations may be made from the temporary water mounts by adding dilute glycerin—

two-thirds glycerin and one-third water—at the edge of the cover glass and allowing the glycerin to run under the latter as the water evaporates. When concentration of the glycerin is adequate, the excess should be wiped away with moist filter paper and the resulting smear removed to the very edge of the cover glass with a soft cloth moistened with 95 per cent alcohol. The preparations may then be sealed from the atmosphere by painting a ring of microscopical cement about the edge of the cover glass. At least two coats should be used for this ring, a light and very narrow one, and, after this dries, a very heavy, broad one. I have used Bell's Microscopical Cement, made in London, and Brunswick Black Cement. A variable percentage of the rings crack in the course of a few years and allow the glycerin to escape from under the cover glass, but the sections in such preparations can be remounted. Dr. Thaxter has very recently informed me that he has been using King's Transparent White Cement and King's Amber Cement for fifteen years and that none of the rings made with these cements have cracked. By the use of circular cover glasses rather than square ones, a microscopist's turn table may be used, thereby materially lessening the labor of preparing the rings.

Systematic Account

THELEPHORACEAE

Thelephoreæ Persoon, Myc. Eur. 1: 109. 1822; Fries, Hym. Eur. 629. 1872; Saccardo, Syll. Fung. 6:513. 1888.

Hymenomycetes with the hymenium inferior or amphigenous (on the lower surface or surrounding the fructification), coriaceous or waxy, even, rarely ribbed or papillate.

Through several of the genera the *Thelephoraceæ* connect closely with all the other families of the *Hymenomycetes*. *Hypochnus* approaches *Grandinia* of the *Hydnaceæ* in the granular hymenial surface of many of the species, but can be separated from this hydnaceous genus by the spore characters. *Lachnocladium*, with coriaceous structure, hairy stem, and colorless spores, is an intermediate genus between *Clavaria*, of the *Clavariaceæ*, and *Thelephora* but can be separated from the latter by the spore characters. *Craterellus* connects with

Cantharellus, of the *Agaricaceæ*. Some species of *Corticium* must be cautiously separated from *Merulius*, of the *Polyporaceæ*. The species of *Tremellodendron*, *Hirneolina*, and *Sebacina* were formerly distributed among *Thelephora*, *Stereum*, and *Corticium* respectively, but are now separated from these genera by the cruciate character of the basidia,—such basidia as are present in many *Tremellaceæ*. All these connecting genera will be included in the present monograph.

Michenera and *Heterobasidium* are excluded genera. Lyman has shown[1] that *Michenera artocreas* B. & C. is only a stage in the life history of *Corticium subgiganteum* B. & C., and that the genus *Michenera* has ceased to be a genus of the Basidiomycetes. My own study of the type of *Heterobasidium chlorascens* Massee, which is the type species of the genus, failed to locate any basidia whatever.

Very many *Thelephoraceæ* are of great economic importance on account of the dry rot induced by the growth of the mycelium in sills, floors, mine, bridge, and dock timbers, and other wooden structures located in moist, poorly ventilated places. *Coniophora puteana* is a common species which rots coniferous wood. Only a very few *Thelephoraceæ* are classed as serious plant parasites. Of these the rhizoctonial stage of *Corticium vagum* is the most important.

Key to the Genera

I. EU-THELEPHOREÆ:

Fructification not containing green lichen gonidia.

Fructification fleshy or membranaceous, often infundibuliform, with the hymenium distinct, continuous, even, ribbed or at length rugose; basidia simple ..... *Craterellus*

Fructification submembranaceous, cup-shaped, often pendulous; hymenium typically concave, discoid; basidia simple ..... *Cyphella*

Fructification consisting of only a fleshy hymenium on the surface of living leaves and shoots; basidia simple ..... *Exobasidium*

Fructification coriaceous or hard 1

1. Basidia globose or pyriform, longitudinally cruciately 4-septate or divided when mature; fructification erect, clavariform, more or less branched ..... *Tremellodendron*

[1] Cultural studies on the polymorphism of Hymenomycetes. Proc. Boston Soc. Nat. Hist. 33: 151–60. 1907.

1. Basidia cruciate as in *Tremellodendron;* fructification effuso-reflexed or cup-shaped with the margin free ..... *Hirneolina*
1. Basidia cruciate as in *Tremellodendron;* fructification always resupinate. *Sebacina*
1. Basidia simple but with such large sterigmata as to resemble longitudinally divided basidia[1] ..... *Tulasnella*
1. Basidia at first globose and simple, at length elongated and transversely septate, straight or curved, bearing sterigmata on the convex side; fructification resupinate ..... *Septobasidium*
1. Basidia simple, usually 4-spored 2
   2. Spores colored; fructification pileate ..... *Thelephora*
   2. Spores colored, rough-walled to echinulate; fructification resupinate ..... *Hypochnus*
   2. Spores ochraceous, ferruginous or fuscous, even; fructification resupinate .. *Coniophora*
   2. Spores white or rarely bright colored, even or rarely uneven 3
3. Setæ (brown, cylindric, rigid, even-walled bodies) present in the hymenium; fructifications range from pileate to resupinate ..... *Hymenochæte*
3. Cylindric teeth composed of many consolidated hyphæ protrude from the hymenium but are not covered by it. Our southern species was originally described as a *Hydnum* ..... *Mycobonia*
3. Neither setæ nor teeth present in the hymenium 4
   4. Fructification coriaceous, erect, clavariform; stem often hairy .. *Lachnocladium*
   4. Fructification cup-shaped, resupinate with free margin or simply resupinate; hymenium pulverulent; with some two or three of the following characters: (1) large white spores ranging from 14–34 x 12–20 μ; (2) much granular matter in the fructification; (3) prominent moniliform or branched paraphyses; (4) racemose organs in the hymenium which produce a crop of conidia before basidiospores develop ..... *Aleurodiscus*
   4. Fructification pileate ranging from infundibuliform and flabelliform to very narrowly reflexed forms; hymenium even. Some reflexed species may occur resupinate ..... *Stereum*
   4. Fructification like that of an urn-shaped *Stereum* but hard and stuffed. One tropical species ..... *Hypolyssus*
   4. Fructification like that of *Stereum* but with the hymenium hardened and with radiating branched ribs. Species tropical ..... *Cladoderris*
   4. Fructification always resupinate; structure not as in *Aleurodiscus* 5
5. Subhymenial tissue contains conspicuous brown stellate organs composed of several radiating arms ..... *Asterostroma*
5. Such brown stellate organs not present 6
   6. Cystidia present in hymenium, or in subhymenial tissue, or in both; structure may be compact or hypochnoid ..... *Peniophora*
   6. Cystidia not present; structure compact or hypochnoid ..... *Corticium*

[1] With regard to the nature of these bodies see H. O. Juel, Bihang till K. Sv. Vet.-Akad. Handl. 23[12]: Afd. III. 3–27. 1897.

II. HYMENO-LICHENS:

Fructification regularly containing green lichen gonidia. Species tropical.

Fructification pileate, coriaceous-membranaceous, with hymenium on the lower surface and somewhat waxy; gonidial layer composed of somewhat cubical masses of algal cells ..... *Cora*

Fructification like *Cora* in most respects but with the hymenium somewhat gelatinous and the gonidial layer composed of algal cells arranged in rows (cateniform) ..... *Rhipidonema*

THELEPHORA

Thelephora Ehrhart [Crypt. Exsic. No. 178. 1785] Fries, Syst. Myc. 1: 428. 1821 (in part).–Persoon, Myc. Eur. 1: 110. 1822 (in part).–Saccardo, Syll. Fung. 6: 521. 1888 (in part).–Hennings, in Engl. &. Prantl, Nat. Pflanzenfam. (1. 1**): 125. 1898 (in part).

The type species of the genus is *Thelephora terrestris* Ehrh. ex Fries.

Fructifications pileate or clavate, coriaceous; hymenium continuous with the hymenophore and similar to it, inferior, or amphigenous in a few species, even or faintly ribbed or papillose; basidia simple, 4-spored; spores colored, typically muricate but even, or rough-walled in a few species.

As more broadly defined by Fries and the other authors cited, *Thelephora* has been heterogeneous, consisting chiefly of the natural and homogeneous group of species defined above but also of some pileate species with simple basidia and hyaline spores, transferred to *Stereum;* also of some species with globose, longitudinally septate basidia, transferred to *Tremellodendron,* if with erect fructifications, or to *Sebacina,* if resupinate; and also of some resupinate species having simple basidia, of which those with muricate and colored spores may be found in *Hypochnus,* those with colored and even spores, in *Coniophora,* and those with hyaline spores, in *Corticium* and *Peniophora.* It is probable that the species of Patouillard's section *Dendrocladium* of the genus *Lachnocladium* as understood by Patouillard [1] might be transferred to *Thelephora* with advantage both to *Thelephora* and *Lachnocladium,* but these species are not within the geographical limits of my work.

[1] Fragments Mycologiques (suite). Jour. de Bot. 3:33–37. 1889.

KEY TO THE SPECIES

Erect species, usually with central stem and pileus divided into very narrow, branching, flattened or cylindric divisions; hymenium inferior or amphigenous 1

Erect species, usually with central stem and more or less infundibuliform, cup-shaped or flabelliform pileus, which may be radially split into lobes and divisions 2

Species of incrusting, effuso-reflexed, dimidiate, or applanate habit 5

1. 2–6 cm. high, much branched, glabrous, with fetid odor when growing, perhaps rarely odorless ..... *1. T. palmata*
1. 3–5 cm. high, much branched, minutely pubescent; stem villose, without fetid odor. Compare *T. multipartita* ..... *2. T. anthocephala*
1. Less than 2½ cm. high, branching at or below surface of ground, dusky drab except at base ..... *3. T. cæspitulans*
1. Less than 2 cm. high, very slender and fragile, cinereous. Known only from State of Washington ..... *4. T. scissilis*
1. Large species, highly branched, with body of spore of regular obovoid form. Known only from Central America ..... *5. T. angustata*

2. Hymenium dark colored, i. e., brown to fuscous 3
2. Hymenium light colored, i. e., pallid to gray 4

3. Small species, 1½–3 cm. high, upper surface usually drying pallid, usually deeply cleft or many-parted into narrow divisions; stem villose. *6. T. multipartita*
3. Small species, 6 mm.–2½ cm. high, infundibuliform or deeply divided into two or three triangular divisions, or flabelliform; stem villose. Closely related to *T. multipartita* ..... *7. T. regularis*
3. Fructification 1 cm. high, white; stem white, glabrous. Known only from Guadaloupe ..... *8. T. pusiola*
3. 1½–5 cm. high, larger species than the three preceding but with thinner pileus, fuscous purple (Rood's brown) throughout, often with the thin lobes imbricate like the petals of a carnation; stem villose ..... *9. T. caryophyllea*
3. 2–4 cm. high, somewhat tubular, hymenium vinaceous brown to drab; stem sulcate and pitted but not villose; spores 10–14 μ in diameter. Known only from Jamaica ..... *10. T. magnispora*
3. Large species, 2½–7 cm. in diameter, with upper surface pallid except at the center and with the hymenium dark ..... *13. T. vialis*

4. Small species, less than 2 cm. in height and in diameter, somewhat pallid to brick-red ..... *7. T. regularis*
4. Pileus with outer lobes forming a cup and with inner lobes distinct, crowded, erect, cinereo-fuscous. Known from Costa Rica and Brazil. *11. T. corbiformis*
4. Large species, 5–7 cm. broad, deeply infundibuliform, habit and color of *Craterellus cornucopioides*. Costa Rica and Jamaica. *12. T. cornucopioides*

5. Growing in applanate clusters, effuso-reflexed, or dimidiate 6
5. Always incrusting (*T. albido-brunnea* is sometimes incrusting) 8

6. Hymenium pale and colored like the pileus, cinnamon-buff; pileus spongy, more than 2 mm. thick; spores 8–10 x 6–8 μ ... *14. T. albido-brunnea*
6. Hymenium and pileus yellowish, less than 2 mm. thick; spores 5–6 x 4 μ *15. T. lutosa*

6. Hymenium drab, becoming sage-green when crushed in 7 per cent potassium hydrate solution; pileus pinkish buff to cinnamon-brown with a broad pale margin.....*16. T. cuticularis*
6. Hymenium ferruginous brown (Rood's brown) to fuscous 7
7. Pileus, when squamulose, with the fibers matted and agglutinated into appressed and wholly adnate squamules, margin dilated and whitish fimbriate becoming entire and concolorous.....*17. T. intybacea*
7. Pileus not zonate, fibrous-squamulose and usually strigose, margin fibrous-fimbriate .....*18. T. terrestris*
7. Pileus zonate, in other respects resembling the preceding species.....*19. T. griseozonata*
8. Incrusting and ascending small plants, free branches somewhat terete but flattened towards the tips; spores umbrinous.....*20. T. fimbriata*
8. Resupinate on leaves and twigs on the ground and sending up free, simple or branching trunks; spores fuscous. Known from Cuba only *21. T. perplexa*
8. Incrusting leaves, etc., on the ground and ascending as sessile flabelliform pilei which are dentate at the upper end or deeply divided, honey-yellow to tawny olivaceous throughout. Known from Cuba only....*22. T. dentosa*
8. Typically effused, rising obliquely upward from the support as a cluster of small trunks which branch and terminate in spiculous tips.*23. T. spiculosa*

1. **Thelephora palmata** Scop. ex Fries, Syst. Myc. 1: 432. 1821. Plate 4. fig. 4.

Clavaria palmata Scop. Fl. Carn. 2: 483. 1760.–*Ramaria palmata* Holmsk. Fun. Dan. 1: 106. *pl.*—.1799. –*Merisma foetidum* Pers. Syn. Fung. 584. 1801.–*M. palmata* Pers. Myc. Eur. 1:113. 1822.–*Thelephora palmata americana* Peck, Rep. N. Y. State Mus. 53: 857. 1900.

Illustrations: Greville, Crypt. Fl. 1: *pl. 46.*–Holmskiold, Fun. Dan. 1: *pl.* of *Ramaria palmata.*–Krombholz, Abbild. und Beschr. *pl. 54. f. 24, 25.*–Nees, System *pl. 16. f. 151 B.*–Baillon, Dictionn. de Botan. 1: 737. *f. 7.*–Loudon, Encyc. of Plants *f. 16131.*–Winter, Crypt. Flora 1: 321.

Fructification coriaceous-soft, fuscous purple, drying cinnabar-brown or chestnut-brown, erect, very much branched, with very fetid odor; pileus with numerous somewhat fastigiate, palmate divisions which are even, flattened, dilated above, and with fimbriate and whitish tips; stem simple or soon branched; hymenium amphigenous; spores pale umbrinous under the microscope, sparingly echinulate, 10 x 7–8 μ.

Fructification of American specimens 2–6 cm. high, 1–3 cm. broad; stem 1–1½ cm. long, 1–2 mm. thick.

On moist ground in coniferous woods and also in grassy fields. Prince Edward Island to North Carolina and west to Illinois. June to October.

In the American collections of this species the divisions of the pileus are narrow and a short stem is present. The habit is so similar to that of *Thelephora anthocephala* that record of the fetid odor should always be made if observed. The ultimate branches may be more or less terete, leading to the variety *americana* Pk.

Specimens examined:

Exsiccati: Ell. & Ev., N. Am. Fungi, 1937.

Austria: *G. Bresadola.*[1]

Sweden: *L. Romell, 53.*

Canada: Rustico Bay, Prince Edward Island, *J. Macoun, 324.*

New Hampshire: Chocorua, *W. G. Farlow.*

? Vermont: no locality data for specimen in Frost Herb., Univ. of Vermont.

Connecticut: Manchester, *C. C. Hanmer, 1398.*

New York: Fischer's Island, *C. C. Hanmer, 196.*

New Jersey: *C. G. Lloyd, 4612.*

Pennsylvania: Bethlehem, *Schweinitz,* Syn. N. Am. Fungi, 612 (in Herb. Schw.); Trexlertown, *Dr. W. Herbst;* Kitanning, *D. R. Sumstine, 2;* West Chester, *B. M. Everhart,* Ell. & Ev., N. Am. Fungi, 1937.

Delaware: Newark, *H. S. Jackson.*

Dist. of Columbia: Washington, *O. F. Cook,* comm. by P. L. Ricker, 1, 3.

N. Carolina: Asheville, *H. C. Beardslee, 924.*

Ohio: Connecticut, *C. G. Lloyd, 4493.*

Illinois: Glencoe, *E. T. and S. A. Harper, 664, 665.*

Missouri: St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42560).

[1] With regard to the citation of specimens all except those of "Exsiccati" are in Burt Herb. which are cited without explicit reference to place in other herbaria. For example, the specimen cited, "Connecticut: Manchester, *C. C. Hanmer, 196,*" is in Burt Herb. The data given is that received with the specimen and may identify a duplicate in another herbarium. The location of all specimens in herbaria other than my own is designated by the name of the herbarium in parenthesis with the prefix "in." For example, the specimen cited, "Louisiana: St. Martinville, *A. B. Langlois* (in Lloyd Herb., 3000)," is in Lloyd Herb., but not in Burt Herb.

2. **T. anthocephala** Bull. ex Fries, Syst. Myc. 1: 433. 1821. Plate 4. fig. 1.

Clavaria anthocephala Bull. Herb. de la France 2: 197. *pl. 452. f. 1.* 1789.

Illustrations: Bulliard, *Ibid. pl. 452. f. 1.*–Sowerby, Col. Figs. Eng. Fun. *pl. 156.*–Berkeley, Outlines Brit. Fung. *pl. 17. f. 4.*–Dufour, Atlas des Champ. *pl. 70.*

Fructification coriaceous-soft, somewhat ferruginous, drying fawn-color or cinnamon-brown, inodorous; pileus pubescent, divided to the stem into flaps which are dilated upwards and fimbriate and whitish at the apex or divided into irregular, branched, erect branches; stem simple, equal, villose; hymenium even; spores pale umbrinous under the microscope, ranging from angular-tuberculate to tuberculate-echinulate, 8–10 x 7–8μ.

Fructifications 3–5 cm. high, 1–3 cm. broad; stem 1–1½ cm. long, 1–2 mm. thick.

On the ground in woods. Massachusetts and Ohio to Louisiana. June to August. Rare.

Our specimens of *T. anthocephala* and *T. palmata* have the same habit but may be separated, even when dried, by the fine pubescence of the pileus visible with a lens, and by the villose-tomentose stem of the former. The spores of *T. anthocephala* are further slightly paler and have shorter spines with broader bases than those of *T. palmata.*

Specimens examined:

Austria: *G. Bresadola.*

Massachusetts: Newton, *W. G. Farlow* (in Farlow Herb.).

New York: Van Cortlandt Park, N. Y. City, *L. O. Overholts* (in Overholts Herb., 688).

Pennsylvania: Kitanning, *D. R. Sumstine, 10;* Bethlehem, *Schweinitz* (in Herb. Schw.), the 614 of Syn. N. A. Fungi under the name *T. flabellaris.*

North Carolina: Asheville, *H. C. Beardslee, 0268.*

Louisiana: St. Martinville, *A. B. Langlois, unnumbered specimen,* and *1971,* and by the same collector (in Lloyd Herb., 3000).

Ohio: Norwood and Linwood, *C. G. Lloyd, 1472* and *02164* respectively.

Kentucky: *C. G. Lloyd, 1395.*

Missouri: St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42559).

3. **T. caespitulans** Schw. Trans. Am. Phil. Soc. N. S. 4: 166. 1831.[1]

Type: in Herb. Schweinitz.

Fructification erect, coriaceous, dusky drab to olive-brown below, paler above, very much branched, forming clusters $2\frac{1}{2}$ cm. high by $2\frac{1}{2}$ cm. broad; pileus with numerous divisions joined together into a solid base but assurgent above and pressed together closely, compressed, subcanaliculate, frequently obtuse and whitish at the apex; hymenium amphigenous; spores umbrinous under the microscope, sparingly tuberculate, 7–8 x 5–6μ.

On the ground in mixed woods, Vermont to South Carolina, and in dense coniferous woods, Washington. September. Rare.

This species is related to *T. palmata* but is more olivaceous, and it is probably inodorous,—at least no odor has been noted. The dimensions for the clusters given above, as stated by Schweinitz, are probably maximum dimensions, for the specimens recently collected have been rather smaller. My Vermont specimens were growing with the thick, solid base buried in sandy ground in a wood road; they have dried pallid except at the base and are slightly pubescent. The general habit of this species is somewhat suggested by a small cluster of *Tremellodendron pallidum* (Schw.) Atk.

Specimens examined:

Vermont: Lake Dunmore, *E. A. Burt.*

Pennsylvania: Bethlehem, *Schweinitz,* type (in Herb. Schw., Acad. Nat. Sci., Phila.).

South Carolina: Santee Canal, *Ravenel, 1660* (in Curtis Herb. under name *T. vialis*).

Washington: Chebalis, *C. J. Humphrey, 1287;* Bingen, *W. N. Suksdorf, 689.*

4. **T. scissilis** Burt, n. sp. Plate 4. fig. 8.

Type: in Burt Herb.

Fructifications gregarious, coriaceous, erect, clavariform, branched, longitudinally ridged by the bases of numerous,

[1] A figure will be given in Part II.

small, appressed, acicular branches, the larger of which are at the apex of the fructification and spread slightly outward in fan-shaped manner; stem glabrous, castaneous; hymenium amphigenous, on upper half of the fructification, avellaneo-cinereous; basidia simple, hyaline, 4-spored; spores pale umbrinous under the microscope, angular, 6–8 x 5–6μ.

Fructifications 1½–2 cm. high; spread of branches at the top 2–6 mm.; stem 7–10 mm. long, 1 mm. thick.

On the ground. Washington. January.

This species is very distinct by its slender erect habit, cinereous color, and only slightly spreading branches.

Specimens examined:

Washington: Bingen, Klickitat Co., *W. N. Suksdorf, 716*, type.

5. T. angustata Fries, (Nov. Symb. Myc. 92.) Actis R. Soc. Sc. Upsal. III. 1: 108. 1851.

Type: in Herb. Fries.

Fructification erect, cinereo-fuscous, pliant, becoming rigid and somewhat woody; stem elongated, radicated, rugose, glabrous, compressed, irregularly divided at the upper end into unequal, fastigiate, compressed branches, which are clothed on the whole outer surface with the hymenium; hymenium amphigenous, subrugose, gray; basidia simple; spores umbrinous under the microscope, obovoid, apiculate at base, flattened on one side, echinulate, 14 x 7–9μ.

On decaying wood. Central America.

Substance, color, and hymenium exactly as in *T. cornucopioides*, but of the very different form of *Clavaria rugosa* and having highly branched forms; stem 5 cm. long; color fuliginous. The fructification is fleshy-pliant when fresh, but on drying hardens much more than species of *Stereum*.

Specimens examined:

Costa Rica: *Oersted* (in Herb. Fries), type.

6. T. multipartita Schw. in Fries, Elenchus Fung. 1: 166. 1828. Plate 4. fig. 7a.

Type: in Herb. Schweinitz.

Fructifications gregarious, erect, coriaceous, fusco-cinereous, usually drying pallid; pileus infundibuliform, sometimes cleft

more or less deeply and unequally into a few lobes, sometimes divided to the stem and spreading so as to appear dimidiate, very often deeply divided and subdivided into many narrow and spreading divisions more or less dilated and whitish at the apex; stem erect or incurved, equal or tapering upward, sometimes branched above, drying walnut-brown or pallid, villose; hymenium inferior, glabrous, even, fawn-color or vinaceous drab; spores unbrinous under the microscope, tuberculate, 7–9 x 5–6μ.

Fructification $1\frac{1}{2}$–$3\frac{1}{2}$ cm. high, 1–3 cm. broad; stem 1–2 cm. long, 1–3 mm. thick.

On ground in groves of broad-leaved trees, especially under oak. New York and Pennsylvania to Illinois. July to September.

The upper surface of the pileus was originally described as glabrous, but it is minutely pubescent under a lens, or sometimes fibrillose. This species is very perplexing by its close relationship to *T. regularis*. The multipartite pileus is the only character which seems available to separate collections of the former from the latter species. If a given collection consists wholly of specimens with pileus many-parted and subdivided into narrow divisions, or if it contains some such specimens in addition to others with more regular infundibuliform pileus, I refer the collection to *T. multipartita*, as in the cases of the collections cited below from C. O. Smith and Dr. C. H. Peck respectively. As yet, I know of no characters by which to assort and separate into their respective species specimens mixed together of typical *T. regularis* and those specimens of *T. multipartita* which have the pileus infundibuliform or merely cleft more or less deeply and unequally into a few lobes. Therefore it is my opinion that *T. multipartita* is a variety of *T. regularis*, but the collections which have so far been submitted to me, have been composed of too few fructifications to assure me that this opinion is correct.

Specimens examined:

Exsiccati: Ell. & Ev., N. Am. Fungi, 2806, under the name *T. caryophyllea*.

New York: Bolton, *C. H. Peck, 3, 4, 5;* Ithaca, *C. O. Smith,* Cornell Univ. Herb., 13359, and *C. O. Smith and W. H. Long,* Cornell Univ. Herb., 7743.

New Jersey: Newfield, *J. B. Ellis,* Ell. & Ev., N. Am. Fungi, 2806.

Pennsylvania: on island in Lehigh River, *Schweinitz,* type (in Herb. Schw.); Bethlehem, *Schweinitz* (in Herb. Schw.), the *T. tuberosa* of Syn. N. Am. Fungi, 613; Trexlertown, *W. Herbst, 22, 36.*

Ohio: *A. P. Morgan,* Lloyd Herb., 2581, 2647; Oxford, *L. O. Overholts* (in Overholts Herb., 1685).

Illinois: River Forest, *E. T. and S. A. Harper, 666.*

7. T. regularis Schw. Schrift. d. Naturforsch. Gesell., Leipzig, 1: 105. 1822. Plate 4. figs. 6, 7b.

Thelephora Ravenelii Berk. Grevillea 1: 148. 1873.–*T. hiscens* Berk. & Rav. Grevillea 1: 148. 1873.

Type: in Herb. Schweinitz, Acad. Nat. Sci., Phila.

Pileus coriaceous, solitary, infundibuliform or divided to the stem into triangular divisions or flabelliform, fibrillose, drying pallid or tawny-olive, darker at center of the cup or at base of the divisions, margin lacerate; hymenium usually hair-brown, sometimes pallid; spores melleus to umbrinous under the microscope, angular-tuberculate, 6–7 x $4\frac{1}{2}$–5μ.

Fructification 6 mm.–$2\frac{1}{2}$ cm. high; pileus 5 mm.–$2\frac{1}{2}$ cm. broad; stem 3–15 mm. long, 1–$1\frac{1}{2}$ mm. thick.

In moss in wet places and on humus. Ontario to Alabama and westward to Kansas.

The differences in form of the pileus of *T. regularis* are well shown by the type in Herb. Schweinitz; this type consists of three fructifications, two of which are infundibuliform, the third and largest, flabelliform. The hymenium is sometimes merely pallid, as in the case of the specimen which is the *T. pannosa* of Schweinitz, Syn. N. Am. Fungi, No. 606, but is not *T. pannosa* Fr. The cotypes of *T. Ravenelii* and *T. hiscens* agree in all respects with the authentic specimen of *T. regularis* in Curtis Herb. Specimens of *T. regularis* which have the pileus infundibuliform and little cleft are suggestive of small specimens of *T. caryophyllea* but differ from the latter by the thicker pileus

and paler coloration of *T. multipartita* which is wholly lacking in the rufescent coloration of *T. caryophyllea*. There is a difference of form between specimens of these two species which is brought out well by the figures in pl. 4.

Specimens examined:

Canada: Shannonville, Ontario, *J. Macoun, 330.*

Maine: Portage, *L. W. Riddle, 4.*

New Hampshire: Chocorua, *W. G. Farlow* (in Farlow Herb.).

Massachusetts: near Boston, *Sprague, 246* (in Curtis Herb. under the name *T. anthocephala*); Newton, *W. G. Farlow* (in Farlow Herb.).

Pennsylvania: Bethlehem, *Schweinitz,* station cited by Schweinitz; also the specimen (in Herb. Schw.) under the name *T. pannosa* of Syn. N. Am. Fungi, No. 606; Trexlertown, *C. G. Lloyd;* Kitanning, *D. R. Sumstine.*

Delaware: Clayton, *H. S. Jackson.*

North Carolina: Salem, *Schweinitz,* type (in Herb. Schw.); *G. F. Atkinson,* Cornell Univ. Herb., 23254.

South Carolina: Greenville, *Ravenel, 1498,* type and cotype (in Kew Herb. and in Curtis Herb. respectively) of *T. Ravenelii* Berk.; Santee Canal, *Ravenel,* type and cotype (in Kew Herb. and in Curtis Herb. respectively) of *T. hiscens* Berk. & Rav.

Alabama: *Peters, 576 bis* (in Curtis Herb. under the name *T. anthocephala*).

Wisconsin: Madison, *W. Trelease* (in Farlow Herb.); Lake Geneva, *E. T. and S. A. Harper, 882,* and (in Harper Herb., 883).

Illinois: East St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42563).

Iowa: Johnson County, *T. J. Fitzpatrick, 39.*

Missouri: St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42564).

Kansas: Bourbon County, *A. O. Garrett, 80.*

8. **T. pusiola** Pat. in Duss, Champ. Guad. & Martinique 12. 1903.

Pileus with divisions triangular, white, hard, thin, entire or cut-lobed, glabrous, even or rugose, sometimes zonate, atten-

uated into a slender stem; stem colored like the pileus, glabrous, cylindric, woody; hymenium inferior, even, brown; basidia clavate, 25 x 10μ, four-spored; spores globose-angular, colorless or somewhat fuliginous, 6 μ in diameter; no cystidia.

Fructification 1 cm. high, divisions 5 mm. broad.

Solitary or in clusters on dead wood. Guadaloupe. Forest of Bains-Jaune, *Duss, 589.*

Var. *terrestris* Pat. *Ibid,* has the divisions of the pileus narrower, laciniate, divergent, rigid.

On the ground, Matouba, Guadaloupe, *Duss.*

I have seen no specimens of either this species or its variety, neither of which have been reported since their original discovery.

9. T. caryophyllea Schaeffer ex Fries, Syst. Myc. **1**: 430. 1821. Plate 4. fig. 9.

Elvella caryophyllea Schaeffer, Icon. Fung. **3**: 115. *pl. 325.* 1762–1774.–*Craterella ambigua* Pers. Obs. Myc. **1**: 36. *pl. 6. f. 8–10.* 1796.–*Thelephora caryophyllea* γ *ambigua* Pers. Myc. Eur. **1**: 112. 1822.

Illustrations: Schaeffer, Icon. Fung. *pl. 325.*–Persoon, Obs. Myc. **1**: *pl. 6. f. 8–10.*–Schnizlein, in Sturm, Deutsch. Flora **3**: fasc. 31. *pl. 6.*–Lanzi, Fungi di Roma *pl. 11. f. 4.*–Saunders and Smith, Myc. Ill. *pl. 41. f. 7–12.*–Smith, W. G. Brit. Basid. 399. *f. 96 a, b.*

Fructifications solitary or cespitose, coriaceous, fuscous purple but drying wood-brown; pileus infundibuliform, simple, or doubled by proliferous growth of smaller pilei from the disk of the principal pileus or of wedge-shaped lobes rising from its upper surface, upper surface radiately ridged or striate with masses of agglutinated fibers which are often dark colored, obscurely zonate when moist, margin incised; stem usually central, cylindric, villose, simple or branched; hymenium inferior, even, grayish olive to light yellowish olive; spores pale umbrinous, tuberculate, 7–8 x 6μ.

Fructification 1$\frac{1}{2}$–5 cm. high, 1$\frac{1}{2}$–5 cm. broad; stem 1 cm. long, 2–3 mm. thick.

On the ground under pines. Canada to South Carolina and west to Ohio, also in the Pacific states. August to November. Abundant locally.

T. caryophyllea may be distinguished from our other northern species which have a central stem and dark hymenium, by the thin lobes of the pileus which dry paler than the hymenium, and by the frequent occurrence of specimens with the pileus consisting of many lobes and pilei imbricately arranged in a manner suggestive of a double pink or carnation, as shown by Schaeffer's fig. 5, and Persoon's fig. 10 of the illustrations cited. Our specimens agree well with the figures of Schaeffer and Persoon—those of Persoon are especially good but unfortunately occur in a work which is very rare.

We find occasionally specimens which agree well with *T. radiata* (Holmsk.) Fr., but these specimens are connected so closely by intermediate forms—often in the same collection—with others which are undoubtedly *T. caryophyllea* that I refer them to the latter species.

Specimens examined:

Sweden: *K. Starback*, in Romell, Fun. Scand., 121.

Canada: *J. Macoun, 54* and *75* of 1903.

Quebec: Hull, *J. Macoun, 190.*

Ontario: London, *J. Dearness* (in Lloyd Herb.).

New Brunswick: Restigouche River, *T. F. Allen*, comm. by Dr. Farlow.

Maine: Orono, *L. W. Riddle, 9.*

New Hampshire: Shelburne, *W. G. Farlow.*

Vermont: Newfane, *C. D. Howe;* Middlebury, *E. A. Burt*, four collections.

Massachusetts: *Sprague, 47, Russell, 131,* and *D. Murray, 545* (all in Curtis Herb.); Worcester, *G. E. Francis, 105.*

Connecticut: East Hartford, *C. C. Hanmer, 1449;* Central Village, *J. L. Sheldon, 68,* comm. by New York Bot. Gard.

New York: Bolton, *C. H. Peck;* Ithaca, *G. F. Atkinson, 9993, 9994;* Saranac Lake, *E. A. Burt;* East Galway, *E. A. Burt.*

Pennsylvania: Bethlehem, *Schweinitz* (in Herb. Schw.), the 608 of Syn. N. Am. Fungi.

Dist. of Columbia: Zoölogical Park, *Coville and Cook, No. A,* comm. by P. L. Ricker.

North Carolina: *Schweinitz* (in Herb. Schw.).

Michigan: *C. G. Lloyd, 4547;* Sailor's Encampment, *E. T. and S. A. Harper, 439,* and Univ. of Wis. Herb., 2.

Ohio: *C. G. Lloyd, 1422, 2720;* Cincinnati, *A. P. Morgan,* Lloyd Herb., 2641, and (in Lloyd Herb., 1152); Loveland, *D. L. James* (in Herb. U. S. Dept. Ag.).

Kentucky: *C. G. Lloyd, 1152.*

Washington: Bingen, *W. N. Suksdorf, 717, 690.*

California: Jackson, *J. H. Barber,* comm. by W. A. Setchell; Stanford University, *C. F. Baker, 255,* distributed by Baker, Pacific Slope Fungi, 3743, under the name *T. radiata* (Holmsk.) Fr.

10. T. magnispora Burt, n. sp. Plate 4. fig. 5.

Type: in Burt Herb.

Fructifications solitary or gregarious, coriaceous, stipitate; pileus irregularly infundibuliform, somewhat tubular, with ascending recurved lobes, drying avellaneous, becoming fuscous at the center with age, fibrous torn becoming radiately striate, margin incised; stem equal, solid, drying hard, irregularly angled, sulcate and pitted, vinaceous brown to drab; hymenium inferior, even, vinaceous brown; basidia simple; spores pale cinnamon, subglobose, echinulate, 10–14 μ in diameter.

Fructification 2–4 cm. high; pileus 1–2 cm. in diameter; stem 7–12 mm. long, 2–5 mm. thick.

On mossy ground. Chester Vale, Jamaica. December.

In some of the specimens the pileus is decidedly eccentric through greater growth on one side than on the other, and it is not always lobed. The offensive odor of the dried specimens and the color of the hymenium are suggestive of *T. cuticularis.*

Specimens examined:

Jamaica: Chester Vale, *W. A. and Edna L. Murrill,* type, New York Bot. Gard., Fungi of Jamaica, 295.

11. T. corbiformis Fries, (Nov. Symb. Myc. 92.) Actis. R. Soc. Sc. Upsal. III. 1: 108. 1851.–Romell, Hymenomycetes Austro-Americani. Bihang till K. Sv. Vet.–Akad. Handl. **26**[16]: Afd. III. 44. 1901.

Type: in Herb. Fries.

Fructification sessile, rigid, cinereo-fuscous, with cespitose lobes of which the outer ascend and coalesce into a rounded

cupulate pileus here and there lacunose-pervious, and the inner are distinct, crowded, erect, narrow; hymenium inferior, uneven, whitish; basidia simple; spores slightly colored, becoming uneven, ovoid, 5–6 x 4–5 μ.

On the ground. Costa Rica and Brazil. January.

"In substance, texture, color, etc., this species agrees exactly with *Thel. cornucopioides* and *Thel. angustata* but in form it exhibits a type unique in the Hymenomycetes. The clusters are regularly rounded, very dense, divided all the way to the base into innumerable lobes, of which the interior are free and erect, the exterior regularly ascendant, broader, compressed, clothed underneath by the hymenium and grown together into a cup here and there lacunose-pervious, undulate-crisped at the apex and fimbriate."—Translation of the original comment on this species.

In 1899, I found the type in Herb. Fries to be cinereo-pallid with a slight fuscous tinge and with basidia and spores as stated above but many of the spores even. Romell describes the spores of his specimens from Brazil as "hyalinæ, laeves, ellips., 5–7 x 3–4 mmm.," and as agreeing with the type. I have reëxamined my sections from the type; the spores are certainly colored and many of them rough-walled.

Specimens examined:

Costa Rica: San José, *Oersted* (in Herb. Fries, Univ. Upsal.), type.

12. T. cornucopioides Fries, (Nov. Symb. Myc. 91.) Actis R. Soc. Sc. Upsal. III. 1: 107. 1851.[1]

Type: not known to be in existence; not in Herb. Fries, at Upsala, nor in Kew Herb.

Pileus pliant becoming rigid, deeply infundibuliform, 5–7½ cm. broad, radiately rugose, glabrous, fuscous; stem solid, rather glabrous, pallid; hymenium inferior, somewhat rugose, gray.

On the ground. Near San José, Costa Rica.

This species bears so singular a resemblance to *Craterellus cornucopioides* that from pictures they are scarcely to be distinguished. The present species has the stem truly solid and the substance fleshy pliant when living, nearly stony-woody when dry; stem 5–7½ cm. long, 4–6 mm. thick, equal or attenu-

[1] A figure will be given in Part II.

ated at the base, compressed, rather glabrous, very tough, pallid; pileus membranaceous-cartilaginous, when dry quite rigid, radiately rugose, with the ridges elevated towards the undulate and at first fimbriate margin, not zonate after the manner of species of *Stereum;* hymenium inferior, hardened. Related to *Cladoderris.*

I refer to *T. cornucopioides* a collection made in Jamaica by Prof. F. S. Earle, in 1902, the specimens of which agree well with the original description, as translated above, except in size. They are 3–3½ cm. high and 2 cm. broad with stem about 1 cm. long by 2–4 mm. thick. The dried fructification is very hard and stony and softens so little with water that the edge of the razor is turned in sectioning. The spores are colorless and even at first and become slightly colored and angular, 9–10 x 6μ.

Specimens examined:

Jamaica: Castleton Gardens, F. S. Earle, New York Bot. Gard., Plants of Jamaica, 238.

13. T. vialis Schw. (Syn. N. Am. Fungi) Trans. Am. Phil. Soc. N. S. **4**: 165. 1834. Plate 5. fig. 15.

T. tephroleuca B. & C. Grevillea **1**:149. 1873.

Type: in Herb. Schweinitz.

Fructification coriaceous, dirty whitish or pallid, sometimes wood-brown at the center, upper surface usually radiately plicate or rough with masses of agglutinated fibers; pileus polymorphic, sometimes composed of ascending lobes or small pilei which arise from a common base and grow together above to form a broad cup, or sometimes with the whole interior of the cup filled with small pilei and lobes many of which arise proliferously from the upper surface of the outer lobes; stem central when present; hymenium inferior, rugose, somewhat papillose, yellowish pallid becoming avellaneous or somewhat fuscous; spores olive-buff under the microscope, bluntly angular (i. e., tips of the angles obtuse), 4½–7 x 4½–5μ.

Fructification 2½–5 or 6 cm. high, 2½–7 cm. broad.

On ground in frondose woods. Vermont to South Carolina and west to Illinois. September.

This is a fine, large species well marked by the dirty whitish or yellowish, fibrillose upper surface of the pileus, thick substance of the same color unless the specimen is old, and the brown,

slightly wrinkled hymenium. As in the otherwise very different *T. caryophyllea*, large specimens sometimes resemble a double flower from the great number of small pileoli and lobes present in the center. Schweinitz described the species as sometimes having dimidiate pilei, but I have seen no such specimens. My collection assumed a disagreeable odor in drying but no such odor has been noted by others.

Specimens examined:

Exsiccati: Ell. & Ev., N. Am. Fungi, 1110, and Fun. Col., 1593, in both under the name *T. caespitulans*.

Vermont: Lake Dunmore, *E. A. Burt.*

New Jersey: Newfield, *J. B. Ellis* (in Mo. Bot. Gard. Herb., 5155), also in the exsiccati cited.

Pennsylvania: Bethlehem, *Schweinitz*, type (in Herb. Schw.); *Michener, 1504* (in Curtis Herb. and in Kew Herb.), the cotype and type respectively of *T. tephroleuca;* Trexlertown, *W. Herbst, 43, C. G. Lloyd and W. Herbst, 2866, 3088* (both in Lloyd Herb.); *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42561).

Dist. of Columbia: Washington, *F. J. Braendle*, comm. by C. H. Peck.

North Carolina: *G. F. Atkinson* (in Cornell Univ. Herb., 23253); Asheville, *H. C. Beardslee;* Schweinitz cited North Carolina as a station.

South Carolina: Caesar's Head, *Ravenel*, one of the types (in Curtis Herb. and Kew Herb.) of *T. tephroleuca*.

Ohio: *C. G. Lloyd, 4000.*

Illinois: Glen Ellen, *E. T. and S. A. Harper, 669.*

14. **T. albido-brunnea** Schw. Trans. Am. Phil. Soc. N. S. 4: 166. 1834. Plate 5. fig. 13.

Stereum Micheneri B. & C. Grevillea 1: 162. 1873 (in part).–*Stereum spongiosum* Massee, Jour. Linn. Soc. Bot. **27**: 172. 1889.–*Thelephora odorifera* Peck, Rep. N. Y. State Mus. **44**: 132 (22). 1891.

Type: in Herb. Schweinitz.

Pileus sessile or with very short stem, coriaceous, spongy when dry, uniformly cinnamon-buff or with the older portions chestnut-brown, sometimes assuming mesopod form when encircling small twigs or shrubs, sometimes effuso-reflexed, usually dimidi-

ate and somewhat imbricated, fibrous-tomentose, margin thick and entire; substance concolorous with the upper surface, spongy, more than 2 mm. thick, with hyphae $4\frac{1}{2}$–5μ in diameter; hymenium inferior, even, not polished, cinnamon-buff; basidia simple; spores deep olive-buff under the microscope, echinulate, 8–10 x 6–8μ.

Pileus 2–4 cm. in diameter when circular, or 1–$2\frac{1}{2}$ cm. long, 2–4 cm. broad, often 1 cm. thick at base when dimidiate.

Running up and encircling twigs on the ground and against the base of shrubs. Canada to Louisiana and west to Wisconsin. August.

Peck describes the odor as quite fragrant at first but states that it is lost after a few weeks; I did not notice any especial odor for my collection. *T. albido-brunnea* may be distinguished from our other dimidiate and reflexed species of *Thelephora* by its even and pale hymenium and thick spongy pileus. Schweinitz confused one collection of this species with *T. biennis* Fr., from the specimen of which in the Fries Herbarium, at Upsala, it is clearly distinct. The types of *Stereum spongiosum* Massee, viz., *Curtis, 3582,* and *Ravenel, 1732,* in Kew Herbarium, have colored echinulate spores 8–10 x 6–7μ, although described by Massee as "ellipsoideæ 6–7 x 4μ" without mention of color and projections of the wall. The type of *Thelephora odorifera* Peck, in Coll. N. Y. State, is somewhat bleached or faded but quite typical.

Specimens examined:

Exsiccati: Ravenel, Fun. Car. IV, 12, the type distribution of *T. Micheneri* B. & C.; Ell. & Ev., N. Am. Fungi, 1599, and Fun. Col., 1209, under the name *T. Micheneri* in both.

Canada: Toronto, *J. Dearness* (in Lloyd Herb.).

Vermont: Lake Dunmore, *E. A. Burt.*

New York: Selkirk, *C. H. Peck* (in Coll. N. Y. State), the type of *T. odorifera* Pk.; Alcove, *C. L. Shear, 1010, 1163, 1184;* Jamesville, *L. M. Underwood.*

Pennsylvania: Bethlehem, *Schweinitz* (in Herb. Schw.), the type, and also the Nos. 627 and 625 of Syn. N. Am. Fungi under the names respectively of *T. biennis* and *T. laciniata; Michener* (in Curtis Herb., 3582, and also in Kew Herb., same number), type of *Stereum spongiosum* Massee; Trexlertown, *W. Herbst, 18,* and (in Lloyd Herb., 3052).

North Carolina: Blowing Rock, *G. F. Atkinson, 4322.*
South Carolina: *Ravenel, 790* (in Curtis Herb. and in Kew Herb.), under the name *Thelephora biennis;* Santee Canal, *Ravenel, 1732* (in Curtis Herb. and in Kew Herb.), type of *Stereum spongiosum* Massee.
Louisiana: Bogalusa, *C. J. Humphrey, 466.*
Ohio: Cincinnati, *A. P. Morgan,* Lloyd Herb., 2627.
Michigan: Saugatuck, *E. A. and S. A. Harper, 654.*
Wisconsin: Milwaukee Co., comm. by Mrs. F. W. Patterson.

15. **T. lutosa** Schw. Trans. Am. Phil. Soc. N. S. 4: 166. 1834.[1]
Type: in Herb. Schweinitz.

Pilei cespitose, densely imbricated, at first somewhat fleshy but at length hard, undulate-plicate, yellowish, almost subtomentose with pulverulence, somewhat horizontally attenuated behind, margin sublobate, at length inflexed; pileus less than 2 mm. thick, with hyphae 3μ in diameter; hymenium becoming yellowish, even; spores olive-buff under the microscope, angular, 5–6 x 3½–4μ.

Cluster about 1½ cm. high and broad.

On the ground in roads and in woods. North Carolina.

The type is distinct from *T. albido-brunnea,* having thinner pileus, finer hyphae, and smaller and paler spores. The pilei were crowded together into a small buff-colored cluster about 1½ cm. high and broad, somewhat as in *Tremellodendron pallidum* (Schw.); I failed to find stems at their bases.

Specimens examined:
North Carolina: Salem, *Schweinitz* (in Herb. Schw.), type.

16. **T. cuticularis** Berk. Hooker's Lond. Jour. Bot. 6: 324. 1847. Republished in Lea, Catalogue of Plants in Vicinity of Cincinnati 66. *d.* 1849. Plate 5. fig. 14.
Type: in Kew Herb., and a portion of it from Berkeley in Curtis Herb.

Pilei coriaceous-soft, effuso-reflexed or dimidiate, imbricate, sometimes laterally confluent, drying pinkish buff to cinnamon-brown, with a broad, pale margin, surface radiately rugose, soft, silky fibrillose; substance of the same color as pileus; hymenium inferior, concave, even, drab to brownish drab; spores umbrinous under the microscope, flattened on one side or somewhat kidney-shaped, not angular, echinulate, 8–9 x 6–7μ.

[1] A figure will be given in Part II.

Pileus 1–1½ cm. long, 2–4 cm. broad, 1 mm. thick.

On mossy bark at the base of trees and on fallen twigs in groves. Vermont to Texas and west to Missouri. June to August.

In his description Berkeley noted that the odor of this species is strong and unpleasant; my specimens retained such an odor for several years but I did not notice it before they were dried. *T. cuticularis* may be distinguished from our other species by its drab hymenium, portions of which become sage-green when crushed under a cover glass in a 7 per cent solution of potassium hydrate, and by its spores, which are not at all angular or irregular as regards the main body of the spore, but ovoid and flattened on one side or slightly kidney-shaped and sparingly studded with slender spines.

Specimens examined:

Vermont: Middlebury, *E. A. Burt.*

Rhode Island: *Olney, 1851* (in Kew Herb. and in Curtis Herb.).

Pennsylvania: Bethlehem, *Schweinitz* (in Herb. Schw.), the Nos. 628 and 629 of Syn. N. Am. Fungi, under the names respectively of *T. fuscocinerea*, and *T. gausapata;* Kitanning, *D. R. Sumstine, 1.*

Delaware: Newark, *H. S. Jackson.*

North Carolina: Asheville, *H. C. Beardslee, 03195.*

Florida: *Mrs. Sams*, comm. by C. G. Lloyd.

Texas: *W. H. Long, Jr., 351, 387* (in Cornell Univ. Herb.).

Ohio: Waynesville, *T. G. Lea* (in Kew Herb.), type; Preston, *A.P. and L. V. Morgan*, comm. by C. G. Lloyd, also *C. G. Lloyd*, specimen dated July 26, 1896; Cincinnati, *C. G. Lloyd, 4492.*

Wisconsin: Blue Mounds, *E. T. and S. A. Harper, 861.*

Missouri: Columbia, *B. M. Duggar, 289.*

17. T. intybacea Pers. ex Fries, Syst. Myc. 1: 431. 1821. Plate 5. fig. 11.

T. intybacea Pers. Syn. Fung. 567. 1801–1807; Myc. Eur. 1: 110. 1822.

Illustrations: Bulliard, Champ. de la France *pl. 278.*–Bigeard et Guillemin, Champ. Super. France 436. *pl. 44. f. 1.*

Fructifications cespitose, soft, whitish, then rufous-ferruginous, drying chestnut-brown to Rood's brown, with stems

somewhat lateral and growing into one another; pilei imbricated, fibrous, usually with the fibers matted and agglutinated into appressed and wholly adnate squamules, margin dilated and whitish-fimbriate at first, at length becoming entire and colored like the rest of the pileus; hymenium inferior, concolorous with the upper surface, papillose; spores concolorous with hymenium, snuff-brown under the microscope, angular-tuberculate, 7–9 x 6–8μ.

Clusters often 5–8 cm. in diameter; individual pileus 2–3 cm. long, 2–4 cm. broad, 1 mm. thick.

On the ground in pine woods, growing up from the layer of fallen leaves. Ontario to North Carolina and westward to Ohio and Michigan. August to October.

The clusters are sometimes central but more often with the pilei lateral and triangular; sometimes the mass ascends small sticks and then extends out from this support in reflexed forms; the upper surface is usually uneven and dries somewhat depressed between the adnate squamules. This species is distinguished from ferruginous specimens of *T. terrestris* by the thicker and entire margin of the pileus and by the absence of free squamules.

Specimens examined:

Exsiccati: Ell. & Ev., Fun. Col., 1410.

Austria: *G. Bresadola.*

Ontario: Toronto, *J. Dearness,* comm. by C. G. Lloyd; Harraby, Lake Rosseau, *E. T. and S. A. Harper, 682.*

Maine: Portage, *L. W. Riddle, 3.*

New Hampshire: Shelburne, *W. G. Farlow.*

Vermont: Middlebury, Sudbury, Grand View Mt., *E. A. Burt.*

Massachusetts: *A. P. D. Piguet,* comm. by Dr. Farlow; Natick, *G. E. Morris, No. E.*

Connecticut: East Hartford, *C. C. Hanmer, 1434.*

New York: Alcove, *C. L. Shear, 1009;* East Galway, *E. A. Burt;* Ithaca, *G. F. Atkinson,* Cornell Univ. Herb., 3050, 19652.

Dist. of Columbia: Takoma Park, *C. L. Shear, 799, 796;* Washington, *O. F. Cook, 4,* comm. by P. L. Ricker.

North Carolina: Asheville, *H. C. Beardslee, 0341.*

Ohio: *A. P. Morgan* (in Lloyd Herb.).

Michigan: *C. G. Lloyd, 4546;* Lawton, *L. A. Hawkins;* Sailor's Encampment, *Allen and Stuntz, 1,* Univ. of Wis. Herb.

18. **T. terrestris** Ehrh. ex Fries, Syst. Myc. 1: 431. 1822.
Plate 5. fig. 10.

T. terrestris Ehrh. Crypt. Exsicc. No. 178. 1785.–Persoon, Syn. Fung. 566. 1801; Myc. Eur. 1: 113. 1822.–*Stereum laciniatum* Pers. Obs. Myc. 1: 36. 1796.–*Thelephora laciniata* Pers. Syn. Fung. 567. 1801.–*T. caryophyllea β laciniata* Pers. Myc. Eur. 1: 112. 1822.–*T. laciniata* Fries, Syst. Myc. 1: 431. 1821.

Illustrations: Batsch, Elenchus Fung. *pl. 24. f. 121.*–Nees, System der Pilze *pl. 34. f. 251.*–Bolton, Hist. Fung. *pl. 173.*–Sowerby, Col. Fig. of Eng. Fungi *pl. 213.*–Cooke, Handbook 1: 310.–Stevenson, Brit. Hym. 2: 261.–Smith, Brit. Basid. 399. *f. 96 C-E.*

Fructifications dark fuscous to fawn-color, coriaceous-soft, cespitose, obconic, with a short stem-like base, or dimidiate and sessile, or incrusting and effuso-reflexed; pileoli more or less imbricated, sometimes laterally confluent, fibrous-squamulose and usually strigose, thin, margin fibrous-fimbriate and laciniate; hymenium inferior, papillose, fuscous to fawn-color; spores pale fuscous, irregular, angular, sometimes slightly tuberculate, 6–9 x 6μ.

Clusters 5–8 cm. in diameter, with single pileolus about 3 cm. long and broad; obconic pileus 2–3 cm. in diameter; dimidiate pileolus 1$\frac{1}{2}$–2 cm. long, 2–3 cm. broad, about 1 mm. thick.

On sandy ground in bare fields and at base of trunks and from fallen twigs and leaves in pine woods. Canada to South Carolina, and in Michigan, Jamaica, and Alaska. July to December.

My observations of this species acquired from specimens received and from seeing it growing abundantly near Middle Grove, N. Y., seem to show that the medium from which this fungus derives its food produces an interesting effect on the fructification. Growing from bare, sandy ground the fructifications are dark fuscous in color, and may be flattened clusters of imbricated pileoli, or of the obconic-pileus type composed of ascending pileoli confluent laterally, or dimidiate, sessile pileoli. When growing on abundant woody matter, as is the case in the specimen in Sowerby's illustration already cited, the fructification assumes a redder color and replaces its dimidiate, sessile pileus on earth by a reflexed one on the wood. With regard to

other forms of the clusters and pileoli, the covering of the upper surface, and the spore characters there is no difference between those fructifications produced without woody food and those having it. There is no sharp color separation between these color extremes.

Specimens growing on the ground usually have a short stem-like base, while those growing on wood are reflexed; the same collection may show both these conditions, as, for example, that from Skagway, Alaska, if some of the fructifications start from sticks and others directly from the ground. Persoon regarded the stem in *T. terrestris* as the chief character separating that species from his *T. laciniata*, as may be seen from his own descriptions contrasting the two in his 'Synopsis Fungorum,' pp. 566 and 567, as follows:

"3. Thel. terrestris: subimbricata obscure fusca, pileo applanato fibroso-strigoso."

"Hab. in arenosis ad terram. *Stipes* breuis, lateralis omnino adest. Substantia submollis, non ita coriacea sicca, vti in ceteris speciebus."

"4. Thel. laciniata: imbricata obscure fusca, pileo tenui laciniato crispo subtus papillis congestis scabro."

"Hab. ad radices truncorum. Cespitem difformem efformat, 2 vnc. lata, tenuis. *Stip.* vix adest distinctus."

These descriptions supplement each other as a description for one species; each has special application to fructifications growing side by side under such conditions as to show that they are from a common mycelium. Persoon never claimed that his species differed from *T. terrestris* in color. Fries gave a different description of *T. laciniata* in his works cited—to the injury of *T. intybacea*—, but the characters he gives are not satisfactory. European mycologists with a wide knowledge of the *Thelephoraceæ* as they grow are unable to distinguish these two species. In letters to me, Bresadola regards *T. laciniata* as a synonym of *T. terrestris;* and Romell does not know *T. terrestris* if it is distinct from *T. laciniata.*

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 511; Ell. & Ev., N. Am. Fungi, 2732, under the name *T. intybacea.*

Austria: *G. Bresadola.*

Sweden: *G. Romell, 52, 55, 56, 57.*

Newfoundland: *A. C. Waghorne, 276* (in Mo. Bot. Gard. Herb.).

Quebec: Gaspe, *J. Macoun, 229.*
Ontario: Ottawa and Belleville, *J. Macoun.*
Maine: Wells, *J. Blake,* comm. by P. L. Ricker.
New Hampshire: Chocorua, *W. G. Farlow.*
Massachusetts: Magnolia and Woods Hole, *W. G. Farlow;* Ipswich, *G. E. Morris, No. F.*
Connecticut: South Windsor, East Hartford, and Rockville, *C. C. Hanmer, 1227–29, 944, 1057.*
New York: East Galway and Middle Grove, *E. A. Burt,* three collections from the latter station; Ithaca, *G. F. Atkinson,* Cornell Univ. Herb., 22976.
New Jersey: Belleplain, *C. L. Shear, 1246;* Newfield, *J. B. Ellis,* Ellis, N. Am. Fungi, 511.
Pennsylvania: *Schweinitz* (in Herb. Schw.), the 624 of Syn. N. Am. Fungi.
North Carolina: Asheville, *H. C. Beardslee, 02280;* Salem, *Schweinitz* (in Herb. Schw.), the 624 of Syn. N. Am. Fungi.
Alabama: Tuskegee, *Beaumont, 199* (in Curtis Herb.).
South Carolina: Society Hill, *M. A. Curtis, 2693* (in Curtis Herb.).
Michigan: Agricultural College, *G. H. Hicks,* Ell. & Ev., Fun. Col., 2732.
Alaska: Skagway, *J. Macoun, 47; Evans, 410* (in Mo. Bot. Gard. Herb.).
Jamaica: Cinchona, *W. A. and E. L. Murrill,* New York Bot. Gard., Fun. of Jamaica, 451.

19. T. griseozonata Cooke, Grevillea **19**: 104. 1891.
Plate 5. fig. 12.

Type: in Ravenel, Fun. Amer., 444.

Fructifications cespitose, coriaceous-soft; pileoli extended into a short sublateral stem, imbricate, applanate, silky-strigose, zonate with alternating cervine (Rood's brown) and light buff zones, margin subfimbriate; hymenium inferior, castaneous when fresh, drying Rood's brown, rugose, somewhat papillose; spores pale fuscous, angular, 6–9 x 6–7μ.

Cluster 3–6 cm. in diameter; obconic pileus and single pileolus each 2–3 cm. in diameter.

On sandy ground in pine woods. New Jersey to Louisiana. August to November.

This species is closely related to *T. terrestris* and has the same habitat, habit of growth, and spore characters, but is distinguished from that species by its zonate pileus. The fructifications usually occur in flattened clusters with spreading pileoli; sometimes the individual pileoli acquire an infundibuliform appearance by the growing together for part of their length of opposite edges of individual pileoli; sometimes a small obconic pileus occurs composed of two or more pileoli with adjacent edges confluent. In the collection cited below from Mississippi, small lobes are present in the cavity of the cup, as in *T. vialis* and *T. caryophyllea*.

Specimens examined:

Exsiccati: Ravenel, Fungi Am., 444, type distribution; Ravenel, Fun. Car. II, 28, under the name *T. caryophyllea;* Ellis, N. Am. Fungi, 714; Ell. & Ev., Fun. Col., 1305.

New Jersey: Newfield, *J. B. Ellis,* in his exsiccati cited.

South Carolina: Aiken, *H. W. Ravenel,* Fungi Am., 444, type collection.

Alabama: Auburn, *C. F. Baker,* Lloyd Herb., 3462.

Mississippi: Biloxi, *Mrs. E. S. Earle, 32.*

Louisiana: St. Martinville, *A. B. Langlois, by.*

20. **T. fimbriata** Schw. ex Schweinitz, Trans. Am. Phil. Soc. N. S. 4: 166. 1834. Plate 4. fig. 3.

Merisma fimbriatum Schw. (Syn. Fung. Car., No. 1067) Schrift. d. Naturforsch. Gesell., Leipzig, 1: 110. 1822.–*Thelephora scoparia* Peck, Rep. N. Y. State Mus. **42**: 123 (27). *pl. 2. f. 20, 21.* 1889.

Illustrations: Peck, Rep. N. Y. State Mus. **42**: *pl. 2. f. 20, 21.*

Type: in Herb. Schweinitz.

Fructification coriaceous-soft, incrusting and ascending small plants (mosses, etc.), here and there emitting fascicles of branches united below, subterete, acuminate or fimbriately incised, at first pale or whitish, soon ferruginous brown, drying Rood's brown; hymenium even, pruinose-pubescent; spores umbrinous, tuberculate, 7–11 x 6–9 μ.

Incrusting and ascending upward 1–3 cm.; free branches 5–10 mm. long, 1 mm. thick, sweep of fascicle about 5–10 mm.

In moist places. New York to South Carolina, and west to Illinois. July and August.

The type is an incrusting specimen, covering as its main axis a small twig in one specimen and a moss in the other, and sending out a few lateral branches which are flattened towards the free ends and subfimbriate; main trunk is cylindric, latericius (of 'Chromotaxia'), ends of branches paler; spores umbrinous under the microscope, tuberculate, 7–8 x 6 μ. Schweinitz described the species as becoming hard and cartilaginous, but this is an error probably due to the foreign matter surrounded by the main trunk. Several other specimens are present in his herbarium under various names.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 512, under the name *T. cristata.*

Massachusetts: Weston, *A. B. Seymour, T 1* (in Mo. Bot. Gard. Herb., 45573).

New York: Bethlehem and Selkirk, *C. H. Peck* (in Coll. N. Y. State), type of *T. scoparia;* Syracuse, from Herb. Cornell Univ., 19474.

New Jersey: Newfield, *J. B. Ellis,* N. Am. Fungi, 512.

Pennsylvania: Bethlehem, *Schweinitz* (in Herb. Schw.), the 615 of Syn. N. Am. Fungi, under the name *T. stabularis.*

North Carolina: Salem, *Schweinitz* (in Herb. Schw.), type, and also the 1063 of Syn. Fung. Car., under the name *Merisma fuscescens.*

Indiana: Millers, *E. T. and S. A. Harper, 670.*

Illinois: Havana, *H. C. Beardslee;* Riverside, *E. T. and S. A. Harper, 668.*

21. T. perplexa Burt, n. sp.[1]

Type: in Curtis Herb.

Fructification incrusting, coriaceous, consisting of a resupinate membrane from the central portion of which arise cylindric trunks either simple or digitately branched; resupinate portion spongy, firm, separable, fuscous at the center, margin thin, determinate, pinkish buff; ascending portions spongy, firm,

[1] A figure will be given in Part II.

fuscous, simple and tapering upward or soon branching and terminating in paler either subulate tips or somewhat flattened ends; spores fuscous, subglobose, echinulate, 8–10 x 8–9μ.

The resupinate membrane may be 3 cm. in diameter; ascending portion of fructification 2–3 cm. high, $1\frac{1}{2}$–2 mm. thick.

On decaying leaves and sticks on the ground. Cuba.

Berkeley & Curtis based their description of *Thelephora dentosa* on two collections made in Cuba by C. Wright in different years; these collections are different specifically. The original description applies chiefly to the earlier collection, made in 1857, which is unnumbered. I take my type of *T. perplexa* from the later collection, *C. Wright, 238.*

Specimens examined:

Exsiccati: Fungi Cubenses Wrightiani, *C. Wright, 238,* under the name *Thelephora dentosa* B. & C.

Cuba: *C. Wright, 238,* type (in Curtis Herb.).

22. T. dentosa Berk. & Curtis emend Burt.[1]

T. dentosa B. & C. (Fungi Cubenses) Jour. Linn. Soc. Bot. 10: 329. 1867.

Type: type and cotype in Kew Herb. and Curtis Herb. respectively.

Fructification coriaceous-soft, incrusting leaves and small twigs on the ground and ascending as free, sessile, dilated, triangular, flabelliform pilei which are dentate at the upper end or deeply divided into a few finger-shaped divisions, honey-yellow to tawny olivaceous throughout, minutely hairy under a lens; spores honey-yellow, globose to ovoid, weakly echinulate, 6–10 x 6–8μ.

Pileus 1 cm. high, 5 mm.–1 cm. broad.

On rotten vegetation. Cuba. June.

As already stated in connection with *T. perplexa,* Berkeley & Curtis cited for types of their *T. dentosa* specimens from two collections made in Cuba by C. Wright. These collections were made with an interval of several years between the collections, which differ specifically. As noted by Berkeley & Curtis, their description applies better to the earlier collection, to which I now

[1] A figure will be given in Part II.

restrict their species. This earlier collection was distributed by C. Wright, unnumbered, under the name *Thelephora dentosa* B. & C. before the publication of the description of this species, and the cotype in Curtis Herb. is unnumbered also. By what was apparently a slip of the pen, Berkeley cited this type as *C. Wright, 507.* By the kindness of Dr. Farlow I have been permitted to examine the manuscript records which show that Wright collected only one No. 507, which was determined by Berkeley as *Xylaria obovata* Berk. and is cited under this species by Berk. & Curtis, Jour. Linn. Soc. Bot. **10**: 380. 1867. I find in Curtis Herb. such a specimen labelled *Xylaria obovata* Berk., Cuba, *C. Wright, 507.* I conclude that the type and cotype of *T. dentosa* B. & C., first cited in their description, are from the collection distributed by C. Wright, unnumbered, under the name *Thelephora dentosa* B. & C.

Specimens examined:

Exsiccati: Plantae Cubenses Wrightianae, unnumbered, under the name *Thelephora dentosa* B. & C.

Cuba: *C. Wright,* cotype (in Curtis Herb.).

23. T. spiculosa Fries, Syst. Myc. **1**: 434. 1821; Epicr. Syst. Myc. 539. 1836–38. Plate 4. fig. 2.

Illustrations: Persoon, Syn. Fung. *pl. 3. f. 16.*

Type: an authentic specimen from Fries, in Kew Herb.

Fructifications cespitose, from byssoid becoming fleshy, variable by incrusting habit, pale buff at first, main portions becoming purplish-fuscous (Rood's brown) with age, ramose-spiculous, tips penicillate and whitish; spores umbrinous under the microscope, irregular, echinulate, 8–9 x 6–7 μ.

Clusters 1–2 cm. high, 2–4 cm. in diameter, single fructification 1–2 cm. high, about 1 mm. in diameter, with branches spreading 4–6 mm.

On leaves on ground in moist groves. Ohio to Wisconsin. July. Rare.

The best specimens which I have seen have main trunks of the fructifications running side by side over partially decayed beech leaves and confluent into an effused mass. These trunks ascend obliquely from the leaves to a height of 1–2 cm., branch sparingly, and terminate in spiculous tips. The fructification

must be inconspicuous in the woods since the general color of the mass is the same as that of the leaves on which it is effused, although the main trunks may be darker.

Specimens examined:

Exsiccati: Kunze, Fun. Sel. Exsic., 560.
Sweden: specimen from Fries (in Kew Herb.).
Austria: *G. Bresadola.*
Ohio: Preston, *C. G. Lloyd.*
Michigan: Glen Lake, *C. G. Lloyd, 02471.*
Wisconsin: Lake Geneva, *E. T. and S. A. Harper, 883.*

(To be continued.)

Explanation of Plate

PLATE 4

All figures of plates 4 and 5 have been reproduced natural size from photographs of dried herbarium specimens of species of *Thelephora.*

Fig. 1. *Thelephora anthocephala.* From specimen collected at Linwood, Ohio, by C. G. Lloyd, No. 02164.

Fig. 2. *T. spiculosa.* *a*, from specimen on leaves of *Fagus* collected in Europe by Bresadola, which I compared with the specimen from Fries in Kew Herbarium; *b*, from specimen collected at Glen Lake, Mich., by C. G. Lloyd, No. 02471.

Fig. 3. *T. fimbriata.* From specimen incrusting living strawberry (*Fragaria*) plant, collected at Riverside, Ill., by E. T. and S. A. Harper, No. 668.

Fig. 4. *T. palmata.* From specimen from New Jersey, from C. G. Lloyd, No. 4612.

Fig. 5. *T. magnispora.* From type specimens collected at Chester Vale, Jamaica, by W. A. and Edna L. Murrill, No. 295. *a* shows upper surface and side of pileus, and *b*, the hymenium.

Fig. 6. *T. regularis.* From a sketch of the type in Herb. Schweinitz.

Fig. 7 *a*. *T. multipartita.* From specimens collected at Trexlertown, Pa., by Dr. W. Herbst.

Fig. 7 *b*. *T. regularis.* From specimens collected at Clayton, Del., by H. S. Jackson.

Fig. 8. *T. scissilis.* From type specimens collected at Bingen, Wash., by W. N. Suksdorf, No. 716.

Fig. 9. *T. caryophyllea.* From specimens collected in Michigan, by C. G. Lloyd, No. 4547.

BURT—THELEPHORACEAE OF NORTH AMERICA

1. THELEPHORA ANTHOCEPHALA.—2. T. SPICULOSA.—3. T. FIMBRIATA.—4. T. PALMATA.—5. T. MAGNISPORA.—6 AND 7 b. T. REGULARIS.—7 a. T. MULTIPARTITA.—8. T. SCISSILIS.—9. T. CARYOPHYLLEA.

Explanation of Plate

PLATE 5.

Fig. 10. *T. terrestris.* From specimens collected on ground in open fields at Middle Grove, N. Y. *a* shows the fibrose-strigose upper surface and fimbriate margin of the pileus, and *b*, the hymenium of lower surface.

Fig. 11. *T. intybacea.* From specimens collected in pine woods incrusting fallen pine leaves and twigs at Middlebury, Vt. *a* shows upper surface with matted, adnate squamules and whitish, thick, entire margin; *b*, the hymenium of lower surface.

Fig. 12. *T. griseozonata.* From specimen of type collection, distributed in Ravenel, Fun. Amer., No. 444.

Fig. 13. *T. albido-brunnea.* *a*, upper side of specimen collected at Saugatuck, Mich., by E. T. and S. A. Harper, No. 654. The specimen is about 2 cm. thick; *b*, hymenium of specimen collected at Lake Dunmore, Vt.

Fig. 14. *T. cuticularis.* From specimens collected at Blue Mounds, Wis., by E. T. and S. A. Harper, No. 861. *a*, viewed obliquely from above; *b*, viewed from under side to show hymenium.

Fig. 15. *T. vialis.* From specimen collected at Lake Dunmore, Vt.

BURT—THELEPHORACEAE OF NORTH AMERICA

10. THELEPHORA TERRESTRIS.—11. T. INTYBACEA.—12. T. GRISEO-ZONATA.—13. T. ALBIDO-BRUNNEA.—14. T. CUTICULARIS.—15. T. VIALIS.

The Thelephoraceae of North America. II

Craterellus

EDWARD ANGUS BURT

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NEW YORK BOTANICAL GARDEN

THE THELEPHORACEÆ OF NORTH AMERICA. II[1]

CRATERELLUS

EDWARD ANGUS BURT

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CRATERELLUS

Craterellus Pers. Myc. Eur. **2**:4. 1825.—Fries, Epicr. 531. 1838; Hym. Eur. 630. 1874.—Saccardo, Syll. Fung. **6**:514. 1888.—Hennings, in Engl. & Prantl, Nat. Pflanzenfam. (1. 1**): 127. 1898.

The type species of the genus is *Craterellus cornucopioides* L. ex Pers.

Fructifications fleshy or membranaceous, pileate, often tubiform, infundibuliform, or flabelliform, sometimes clavate; hymenium waxy-membranous, distinct, continuous, adnate to the hymenophore, even or rugose; basidia simple; spores usually white.

Craterellus is closely related by its fleshy *C. Cantharellus*, *C. odoratus*, *C. lutescens*, etc., with the genus *Cantharellus*. These species resemble so closely in coloration and habit species of the latter genus that careful examination of the hymenium should be made for generic determination. *Craterellus* has its hymenium even or slightly rugose. In exceptional connecting species, such as *C. clavatus*, it is somewhat lamelliform for a part of the distance from margin of the pileus to the stem. The clavate *C. pistillaris* and *C. unicolor* connect *Craterellus* closely with *Clavaria*.

Craterellus cornucopioides, *C. ochrosporus*, *C. clavatus*, *C. Cantharellus*, and *C. odoratus* are edible species, which are often abundant locally.

[1] Issued September 30, 1914.

NOTE.—Explanation in regard to the citation of specimens studied is given in Part I, Ann. Mo. Bot. Gard. 1: 202, footnote. The technical color terms used in this work are those of Ridgway, Color Standards and Nomenclature. Washington, D. C., 1912.

Key to the Species

Hymenium somewhat radiately lamelliform—at least near the margin; stem solid 1
Hymenium plane, rugose-wrinkled, or ribbed and rugose-wrinkled 2
1. Fructification large, 4–10 cm. high; stem about 1 cm. thick; spores 10–13 x 4–4½ μ ..... *1. C. clavatus*
1. Fructification small, 1–1½ cm. high; stem 1 mm. thick; pileus umbilicate; spores 9 x 7 μ ..... *11. C. delitescens*
2. Fructification with pileus infundibuliform and pallid rose; hymenium and stem white. In N. Carolina in moss near *Kalmia* bushes ..... *4. C. roseus*
2. Fructification entirely egg-yellow, about 3–9 cm. high, 2½–9 cm. broad ... 3
2. Fructification neither entirely egg-yellow nor with pileus pallid rose and hymenium and stem white 4
3. Pileus convex, then depressed or infundibuliform; stem solid ... *2. C. Cantharellus*
3. Pileus convex, then depressed or cyathiform; stem hollow or cavernous; fructification sometimes branched ..... *3. C. odoratus*
4. Pileus tubiform with cavity extending nearly or quite to the base of the stem 5
4. Pileus not tubiform, but instead infundibuliform, depressed, truncate, convex, or flabelliform 6
5. Pileus and stem smoky brown to blackish; hymenium cinereous drab; spores 12–16 x 6–10 μ ..... *5. C. cornucopioides*
5. Pileus drying avellaneous to snuff-brown; stem black with chamois-colored pubescence at its base; hymenium chamois-colored or colored like the pileus; spores 12–15 x 7–8 μ ..... *6. C. ochrosporus*
5. Pileus somewhat tubiform; hymenium dark cinereous; spores 6–7½ x 4½–5 μ ..... *7. C. dubius*
5. Pileus somewhat tubiform or umbilicate, yellowish brown to fuscous; hymenium and stem yellow; spores 10–12 x 6–8 μ ..... *8. C. lutescens*
6. Pileus infundibuliform, 2–3 cm. broad; hymenium pallid cinereous; spores 10–12 x 6–7 μ ..... *9. C. sinuosus*
6. Pileus deeply cup-shaped, 4–8 mm. broad; hymenium cream-buff; spores 8 x 6 μ ..... *10. C. calyculus*
6. Pileus convex, then umbilicate, 5 mm. broad; hymenium sometimes obscurely lamelliform, chamois-colored; stem chamois-colored; spores 9 x 7 μ ..... *11. C. delitescens*
6. Pileus merely depressed, truncate, convex, or clavate 7
6. Pileus flabelliform 8
7. Fructification small, 1–3 cm. high, 4–9 mm. broad, narrowly obconic, white; spores 3–4 μ in diameter ..... *12. C. taxophilus*
7. Fructification 2–5 cm. high, from obconic often becoming abruptly enlarged and somewhat cerebriform at the upper end but with the stem remaining comparatively slender ..... *13. C. unicolor*
7. Fructification large, 6–15 cm. high, clavate or obconic and truncate, tapering downward; stem often bulbous at the base. Fructification dries sorghum-brown to fuscous ..... *14. C. pistillaris*
8. Pileus ligulate at first, then spreading laterally and becoming somewhat palmately cleft into a few branches, fawn-color shading into bone-brown. Known from Ohio ..... *15. C. palmatus*

8. Pileus somewhat triangular, drying a dirty pinkish buff; hymenium drying Isabella-color to clay-color. Known only from Florida. . *16. C. dilatus*
8. Fructification entirely white; pileus reniform, dimidiate, attached laterally to a slender erect stem. Known only from Washington *17. C. Humphreyi*

1. **Craterellus clavatus** Pers. ex Fries, Epicr. 533. 1836–1838. Plate 15. fig. 6.

Merulius clavatus Pers. Obs. Myc. 1: 21. 1896.—*Cantharellus clavatus* Fries, Syst. Myc. 1: 322. 1821.—*Nevrophyllum clavatum* Fries ex Patouillard, Tab. Anal. Fung. 1: 193. *f. 434.* 1883–1886.—*Cantharellus brevipes* Peck, Rep. N. Y. State Mus. **33**: 21. *pl. 1. f. 18–20.* 1879.

Illustrations: Schæffer, Icon. Fung. *pl. 164, 276.*—Krombholz, Abbild. und Beschr. *pl. 45. f. 13–17.*—Fries, Sverig. Ätl. Svamp. *pl. 91.*—Richon et Roze, Atlas Champ. *pl. 50. f. 10–14.*—Bresadola, Funghi Manger. *pl. 82.*—Peck, Rep. N. Y. State Mus. **33**: *pl. 1. f. 18–20.*—Harper, Mycologia **5**: *pl. 93, 94.*

Fructifications solitary or cespitose, fleshy, flesh whitish; pileus narrowly obconic, turbinate, truncate or depressed, glabrous, ochraceous buff, attenuated into the stem, the margin thin and erect; stem short, solid, tomentose at the base; hymenium lamelliform near the margin, rugose-wrinkled elsewhere, becoming pruinose with the spores, light vinaceous drab, drying drab; spores pale ochraceous in the mass, 10–13 x 4–4½ μ.

Fructifications 4–10 cm. high; pileus 3–8 cm. broad; stem 1–2 cm. long, 8–15 mm. thick.

On the ground in coniferous woods. Maine to Connecticut and west to Minnesota, and in Montana. July to September.

This species is intermediate between *Craterellus* and *Cantharellus.* The marginal portion of the hymenium is like that of a *Cantharellus,* and the remainder of the hymenium, like that of a *Craterellus.* There is good authority for including this species in *Cantharellus* and there is the authority of Fries and herbarium usage for classing it in *Craterellus. C. clavatus* is edible but too rare, at least in the east, to be common in herbaria.

Specimens examined:

Exsiccati: De Thuemen, Myc. Univ., 1807.

Austria: *G. Bresadola.*

Maine: *Sprague* (in Curtis Herb., 5786).

New Hampshire: Shelburne, *W. G. Farlow* (in Mo. Bot. Gard. Herb., 4868).

Vermont: Lake Dunmore, *E. A. Burt.*

Connecticut: Rainbow, *C. C. Hanmer, 1454* (in Hanmer Herb.).

New York: Ballston, *C. H. Peck*, the type of *Cantharellus brevipes* (in Coll. N. Y. State).

2. C. Cantharellus Schw. ex Fries, Epicr. 534. 1836–1838. Plate 15. fig. 7.

Thelephora Cantharella Schw. Schrift. d. Naturforsch. Gesell., Leipzig, 1: 105. 1822.—*Craterellus lateritius* Berk. Grevillea 1: 147. 1873.

Illustrations: Peck, Rep. N. Y. State Mus. **49**: *pl. 44. f. 1–5;* Mem. N. Y. State Mus. **3**[4]: *pl. 56. f. 17–21.*—Hard, Mushrooms *f. 378.*—Marshall, Mushroom Book 73. *f.*

Type: in Herb. Schweinitz.

Fructifications single or cespitose, fleshy, firm, egg-yellow; pileus convex, becoming depressed or infundibuliform, glabrous, yellow, the margin often lobed or irregular; stem solid, cylindric or tapering downward, glabrous, yellow; hymenium nearly even or rugose wrinkled, yellow, or with a reddish salmon tinge and drying ochre-red; spores 7–10 x $3\frac{1}{2}$–$5\frac{1}{2}$ μ.

Fructifications 4–9 cm. high; pileus $2\frac{1}{2}$–8 cm. broad; stem $2\frac{1}{2}$–5 cm. long, 5–10 mm. thick.

On the ground in open woods. Massachusetts to Alabama and westward to Ohio; also in Mexico. June to September. Abundant locally.

This species is so similar to *Cantharellus cibarius* in habit, coloration, size and form—differing from the latter only in the more even hymenium, that figures of *C. cibarius* will serve very well for *Craterellus Cantharellus,* if allowance is made for the different hymenium. The firm and solid stem of *C. Cantharellus* distinguishes this species from *C. odoratus* easily. The latter species sometimes has its pileus greatly branched. My illustration of this species is photographed from the dried herbarium specimen of the cotype of *C. lateritius* Berk. In this specimen the lobes of the pileus were pressed together above before drying. The hymenium of this specimen is now ochre-red and agrees in color with that of the authentic specimen of *C. Cantharellus* in Curtis Herb.; both these specimens have been poisoned. I

found the spores of the type in Herb. Schw. 8–9 x $3\frac{1}{2}$–4 μ, or a little slenderer than in northern specimens. Hard states that the spores are yellowish or salmon colored in the mass when collected. This species is edible.

Specimens examined:

Exsiccati: Ell. & Ev., N. Am. Fungi, 1921.

Massachusetts: *Sprague* (in Curtis Herb.); Milton, *H. Webster.*

Connecticut: East Hartford, *C. C. Hanmer, 2391, 2468* (both in Hanmer Herb.).

Pennsylvania: West Chester, *B. M. Everhart,* Ell. & Ev., N. Am. Fungi, 1921.

West Virginia: Eglon, *C. G. Lloyd, 02292.*

North Carolina: *Schweinitz,* type (in Herb. Schweinitz); Blowing Rock, *G. F. Atkinson, 4313.*

South Carolina: Clemson College, *P. H. Rolfs, 1830.*

Alabama: *Peters* (in Curtis Herb., 4539, and in Kew Herb.), the cotype and type respectively of *C. lateritius;* Auburn, *F. S. Earle* (in Mo. Bot. Gard. Herb., 4928).

Ohio: *A. P. Morgan* (in Lloyd Herb.).

Kentucky: *C. G. Lloyd* (in Lloyd Herb.).

Mexico (?): *Botteri, 27* (in Curtis Herb.). If the stem is hollow this specimen is *C. odoratus.*

3. **C. odoratus** Schw. ex Fries, Epicr. 532. 1836–1838.
Plates 15, 16. figs. 8–10.

Merulius odoratus Schw. Schrift. d. Naturforsch. Gesell., Leipzig, 1: 91. 1822.—*Cantharellus odoratus* Fries, Elenchus Fung. 1: 51. 1828.—*C. confluens* Berk. & Curtis, Jour. Linn. Soc. Bot. 9: 423. 1867.

Type: in Herb. Schweinitz.

Fructifications gregarious, sometimes cespitose, simple or branched, egg-yellow; pileus thin, convex, then depressed and somewhat cyathiform, sometimes pervious, yellow, the margin deflexed, often lobed or irregular; stem cylindric or somewhat tapering towards the base, concolorous with the pileus, hollow or cavernous; hymenium even or somewhat rugose-wrinkled, ochraceous orange or with a reddish tinge approaching Sanford's brown; spores even, 7–9 x 4–5 μ.

Fructifications 3–7 cm. high; pileus 2–9 cm. broad; stem 2–4 cm. long, 3–8 mm. thick.

In moist places in woods. North Carolina and Georgia to Ohio and Missouri. June to October.

Specimens of this species have sometimes been confused in recent years with the better known *C. Cantharellus*, which ranges farther north. The color and general habit of these species is the same; both have the egg-yellow color and the characteristic fragrance of *Cantharellus cibarius* when moistened after drying, and all three are edible. *Craterellus odoratus* is more membranaceous than *C. Cantharellus* and it differs from both this species and *Cantharellus cibarius* in having a hollow or cavernous stem whose pliant walls may be pinched together, like those of a rubber tube, before the specimens are dried. Highly branched forms may occur as shown in pl. 16 fig. 10a; this character was unduly emphasized in the original description. The ample collections in the Glatfelter Herbarium seem to show that *Craterellus odoratus* is the most frequent *Craterellus* in the vicinity of St. Louis. Dr. Glatfelter notes on his collection that he has eaten this species and found it quite good. In pl. 15 fig. 8, I give a figure, natural size, from a photograph of the dried herbarium cotype of *C. confluens* B. & C., to show how close the resemblance is to the specimens of *C. odoratus*, collected at St. Louis and figured in the following plate. The type of *C. confluens* has the hymenium rugose-wrinkled, as is often the case in specimens of *C. odoratus;* its habit, dimensions, structure, coloration, and spores are quite those of *C. odoratus*.

Specimens examined:

North Carolina: Salem, *Schweinitz*, type (in Herb. Schweinitz).
South Carolina: Society Hill, *Ravenel, 192* (in Curtis Herb.).
Georgia: Station cited by Schweinitz.
Alabama: Auburn, *L. M. Underwood.*
Ohio: Oxford, *L. O. Overholts, 1721* (in Overholts Herb.).
Missouri: near St. Louis, *N. M. Glatfelter, 348* (in Mo. Bot. Gard. Herb., 42590), and *J. B. S. Norton* (in Mo. Bot. Gard. Herb., 4926).
Mexico: near Orizaba, *Botteri, 6* (type and cotype in Kew Herb. and Curtis Herb., respectively, of *C. confluens*).

4. **C. roseus** Schw. ex Fries, Epicr. 533. 1836–1838.
Merulius roseus Schw. Schrift. d. Naturforsch. Gesell., Leip-

zig, 1: 91. 1822.—*Cantharellus roseus* Fries, Elenchus Fung. 53. 1828.

Fructifications solitary, somewhat fleshy; pileus infundibuliform, somewhat strigose, pallid rose, the margin lobed and inflexed; stem apparently stuffed, attenuated downward, white; hymenium somewhat rugose, white.

In mosses, especially in proximity to *Kalmia*. North Carolina.

Specimens of this species have the habit of *Cantharellus cibarius* but are thinner. Fries received a specimen of *Craterellus roseus* from Schweinitz and expressed the opinion in 'Elenchus' that the species is good. I have seen no specimens of *C. roseus* and base the above on the original description and the comments by Schweinitz and Fries.

5. C. cornucopioides L. ex Pers. Myc. Eur. **2**: 5. 1825. Plate 17. fig. 17.

Peziza cornucopioides L. Sp. Pl. 1181. 1753. [1st ed.]—*Elvella cornucopioides* Scop. Fl. Carn. **2**: 476. 1760.—*Merulius cornucopioides* Pers. Syn. Fung. 491. 1801.—*Cantharellus cornucopioides* Fries, Syst. Myc. **1**: 321. 1821.

Illustrations: Vaillant, Botan. Paris. *pl. 13. f. 2, 3.*—Bolton, Hist. Fung. *pl. 103.*—Flor. Dan. *pl. 384, 1260.*—Holmskiold, Fung. Dan. **2**. *pl. 5.*—Sowerby, Brit. Fung. *pl. 74.*—Schæffer, Icon. Fung. *pl. 165.*—Bulliard, Herb. de la France *pl. 150.*—Schnizlein, in Sturm, Deutsch. Flora **3**: fasc. 31. *pl. 5.*—Bresadola, Funghi Manger. 75. *pl. 83.*—Cooke, Brit. Edible Fung. *pl. 11. f. 39.*—Dufour, Atlas Champ. *pl. 70. f. 157.*—Hard, Mushrooms 451. *f. 379.*—Peck, Rep. N. Y. State Mus. **48**: *pl. 24. f. 7–10.*—cf. Saccardo, Syll. Fung. **19**: 478, for other references to illustrations.

Fructifications gregarious or somewhat cespitose; pileus thin, somewhat membranaceous, tubæform, pervious, sometimes granular or minutely squamulose, smoky brown to blackish, usually drying Prout's brown, with the erect, spreading, or decurved margin generally lobed, wavy, or irregular; stem short, hollow, even, blackish brown; hymenium even or rugose-wrinkled, cinereous drab; spores hyaline, even, 12–16 x 6–10 μ.

Fructification 5–8 cm. high; pileus $2\frac{1}{2}$–5 cm. broad; stem 1–3 cm. long, 3–5 mm. thick.

On earth in mixed woods. Canada to South Carolina and westward to Missouri. June to September.

The cornucopia craterellus is well characterized by its cornucopia-shaped or narrowly trumpet-shaped pileus ashy to sooty brown in color, by thin flesh which is somewhat tough and flexile, cinereous drab hymenium which sometimes has a brownish tinge, and black stem. This species is too infrequent to afford more than a few herbarium specimens in the regions where I have collected fungi, but it is reported so plentiful in some states as to be highly regarded as an edible species.

Specimens examined:

Exsiccati: Ravenel, Fung. Car. II. 27; Ellis, N. Am. Fungi, 321; Ell. & Ev., Fung. Col., 1723; Shear, N. Y. Fungi, 49; Rabenhorst-Winter, Fung. Eur., 3640.

Sweden: *L. Romell, 48.*

Canada: *J. Macoun, 72, 73.*

Ontario: Casselman, *J. Macoun, 347.*

Vermont: Grand View Mt., *E. A. Burt.*

Massachusetts: *Sprague, 211* (in Curtis Herb.).

Connecticut: *W. A. Setchell.*

New York: Sand Lake, *C. H. Peck* (in Coll. N. Y. State); Alcove, *C. L. Shear*, Shear's N. Y. Fungi, 49; Ithaca, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 4763, 42584), *W. H. Long, Jr.*, Ell. & Ev., Fung. Col., 1723.

New Jersey: Newfield, *H. Leahy*, Ellis, N. Am. Fungi, 321.

Pennsylvania: locality cited by Schweinitz, Syn. N. Am. Fungi; *W. Herbst* (in Lloyd Herb.).

North Carolina: (in Curtis Herb., 502); locality cited by Schweinitz, Syn. Fung. Car. Sup.

South Carolina: *M. A. Curtis* (in Curtis Herb.).

Ohio: Loveland, *D. L. James*, comm. by U. S. Dept. Agr.

Kentucky: Mammoth Cave, *C. G. Lloyd.*

Missouri: Perryville, *C. H. Demetrio*, Rabenhorst-Winter, Fung. Eur., 3640; Meramec Highlands, *P. Spaulding* (in Mo. Bot. Gard. Herb., 4869).

6. C. ochrosporus Burt, n. sp. Plate 17. fig. 15.

An *C. ocreatus* Pers. Myc. Eur. **2**: 5. *pl. 13. f. 2.* 1825?

Type: in Mo. Bot. Gard. Herb., 42585.

Fructifications gregarious or cespitose; pileus thin, somewhat

membranaceous, tubæform, pervious, minutely floccose-squamulose, drying avellaneous to snuff-brown, the margin erect or decurved; stem short, hollow, black, with chamois-colored pubescence at the base; hymenium even or somewhat rugose, sometimes colored like the pileus but in the type chamois-colored; spores straw-yellow in the mass, even, obtuse, 12–15 x 7–8 μ.

Fructifications 4–7 cm. high; pileus 1–3½ cm. broad, 1–2½ cm. long, 2–4 mm. thick.

On the ground among mosses in woods. New York and Missouri. June to September. Probably abundant in Missouri.

Dr. Glatfelter noted a pleasant minty odor for the specimens. This species closely resembles *C. cornucopioides* in form, but differs from that species in having hymenium, spores, and base of stem yellow. A collection from the same spot from which the type collection came, but made in June two years later, has the hymenium snuff-brown and approaches *C. cornucopioides* in this respect. I am not aware of any data on *C. ocreatus* Pers. except that based on the original description which is cited above. That species has presumably not been collected by European mycologists since the original collection from the environs of Paris a century ago. Our specimens differ from that description in having the stem yellow pubescent at the base and the hymenium somewhat rugose, and they may differ in other characters, e. g., spore colors, etc., not given in the brief description of *C. ocreatus*. Hence I give to our American specimens a distinct name.

Specimens examined:

New York: East Galway, *E. A. Burt.*

Missouri: Meramec Highlands, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 42585, type, and 42586–87); Columbia, *B. M. Duggar, 134.*

7. C. dubius Peck, Rep. N. Y. State Mus. **31**: 38. 1879.

Illustrations: Hard, Mushrooms *f. 380.*

Type: in Coll. New York State.

Fructifications solitary or cespitose; pileus thin, infundibuliform or subtubiform, subfibrillose, dark brown or lurid brown, pervious, the margin generally wavy and lobed; stem short, hollow, colored like the hymenium; hymenium dark

cinereous and rugose when moist, the obscure crowded irregular wrinkles abundantly anastomosing, nearly even and paler when dry; spores broadly elliptical or subglobose, 6–7½ x 4½–5 μ.

Fructification 5–7½ cm. high; pileus 2½–5 cm. broad, 4 mm. thick.

On ground in woods. Ontario and New York to Illinois. August to October. Rare.

The specimens of this species have the same coloration as those of *C. cornucopioides* but differ from the latter in having a shorter and more funnel-shaped pileus, and smaller spores. Moffatt reported *C. dubius* as abundant at Glencoe, Illinois.

Specimens examined:

Ontario: Belleville, *J. Macoun, 228* (in Coll. N. Y. State).
New York: Adirondack Mts., *C. H. Peck,* type (in Coll. N. Y. State).
Michigan: Sailor's Encampment, Univ. of Wis. Herb., 46.

8. C. lutescens Pers. ex Fries, Epicr. 532. 1838.

Plate 17. fig. 20.

Merulius lutescens Pers. Syn. Fung. 489. 1801; Albertini & Schweinitz, Consp. Fung. 234. 1805.—*Cantharellus lutescens* Fries, Syst. Myc. 1: 320. 1821.—*Merulius xanthopus* Pers. Myc. Eur. 2: 19. *pl. 13. f. 1.* 1825.

Illustrations: Vaillant, Botan. Paris. *pl. 11. f. 9, 10.*—Schæffer, Icon. Fung. *pl. 157.*—Bolton, Hist. Fung. *pl. 105. f. 2.*—Persoon, Myc. Eur. 2: *pl. 13. f. 1.*—Hennings, in Engl. & Prantl, Nat. Pflanzenfam. (1.1**): 129. *f. 70 H.*—Stevenson, Brit. Hym. 2: 259.

Fructifications solitary to cespitose; pileus thin, somewhat membranaceous, varying from convex and umbilicate to tubiform or funnel-shaped, often pervious, yellowish brown to fuscous, with margin often lobed or irregular; stem flexuous, cylindric, hollow, yellow, drying ochraceous buff, often hairy at the base; hymenium remotely ribbed, even or rugose-wrinkled, yellow, drying cadmium-yellow to ochraceous buff; spores even, 10–12 x 6–8 μ.

Fructifications 2½–5 cm. high; pileus 1½–3 cm. broad, stem 1½–4 cm. long, 2–4 mm. thick.

On moist ground in woods and swamps. Newfoundland to North Carolina and westward to Michigan. August to October.

This species probably ranks next to *C. cornucopioides* in frequency in the United States. The long and yellow stem readily distinguishes this species from *C. ochrosporus*. Specimens of *Cantharellus infundibuliformis* resemble those of *Craterellus lutescens* in form, size, and color, but those of the former species have true lamellæ.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 1302; De Thuemen, Myc. Univ., 404.

Sweden: Stockholm, *L. Romell, 49;* Femsjö, *L. Romell.*

Newfoundland: Bay of Islands, *A. C. Waghorne, 34* (in Mo. Bot. Gard. Herb.).

New Hampshire: Shelburne, *W. G. Farlow*, Ellis, N. Am. Fungi, 1302, and (in Mo. Bot. Gard. Herb., 4932).

Vermont: Lake Dunmore, *E. A. Burt.*

Massachusetts: Worcester, *G. E. Francis, 100.*

New England: *Sprague, 1689* (in Curtis Herb.).

New York: Sand Lake and Helderberg Mts., *C. H. Peck* (in Coll. N. Y. State); East Galway, *E. A. Burt.*

Pennsylvania: locality cited by Schweinitz, Syn. N. Am. Fungi.

North Carolina: locality cited by Schweinitz, Syn. Fung. Car. Sup.

Michigan: Glen Lake, *C. G. Lloyd, 02462.*

9. **C. sinuosus** Fries ex Fries, Epicr. 533. 1836–1838.

Cantharellus sinuosus Fries, Syst. Myc. **1**: 319. 1821.

Illustrations: Vaillant, Botan. Paris. *pl. 11. f. 11–23.*—Fries, Icon. Hym. **2**: *pl. 196. f. 2.*—Dangeard, Le Botaniste **4**: 147. *f.*—Gillet, Champ. France Hym. *pl.*

Fructifications cespitose, slightly fleshy; pileus infundibuliform, undulate and floccose, light drab; stem cylindric, stuffed, pallid cinereous; hymenium at length with interwoven wrinkles, pallid cinereous; spores 10–12 x 6–7 μ.

Fructifications 2–3 cm. high; pileus 2–3 cm. broad; stem $1\frac{1}{2}$–2 cm. long, 2–4 mm. thick.

On ground in mixed woods. South Carolina. Rare.

I have seen only dried herbarium specimens of *Craterellus sinuosus*. The spore measurements are those of a specimen from Sweden received from Romell. In this specimen the hymenium has dried somewhat chamois-colored.

Specimens examined:
Exsiccati: Rabenhorst, Fung. Eur., 208 (in Kew Herb.).
Sweden: *L. Romell, 50.*
South Carolina: *Ravenel* (in Curtis Herb., 2982).

C. crispus Fr., sometimes regarded as a variety of *C. sinuosus*, was reported from New England, *Sprague*, by Berkeley & Curtis, Grevillea 1: 147, but the specimen is not satisfactory for study. I do not, therefore, like to include *C. crispus* as one of our species.

10. **C. calyculus** (B. & C.) Burt, n. comb.

Stereum calyculus Berk. & Curtis, Hooker's Jour. Bot. and Kew Gard. Misc. 1: 238. 1849; Grevillea 1: 161. 1873.

Type: type and cotype in Kew Herb. and Curtis Herb. respectively.

Fructifications somewhat fleshy-membranaceous; pileus thin, deeply cup-shaped, minutely tomentose, drying Saccardo's umber, opaque; stem apparently hollow, cream buff, attenuated below, tomentose at the base; hymenium even or slightly venose, cream buff; spores slightly yellowish under the microscope, even, 8 x 6 μ.

Fructifications 2–3 cm. high; pileus 4–8 mm. broad; stem 1 cm. long, 1–2 mm. thick.

On ground in damp shady woods. North and South Carolina. August and September.

Upon moistening, the type in Kew Herbarium proved too soft and fleshy and the hymenium too waxy for a *Stereum*. The sections have the structure of *Craterellus*. The species is near *C. sinuosus* and may prove to be a small form of this when ample material gives more complete knowledge of the species, but, for the present, I regard *C. calyculus* as a distinct species. I refer to *C. calyculus* a collection made by Professor Atkinson at Blowing Rock, North Carolina, the rough-dried and cespitose specimens of which show a somewhat tubiform pileus and spores 7–8 x 4½ μ.

Specimens examined:
North Carolina: Blowing Rock, *G. F. Atkinson, 4200.*
South Carolina: Santee River, *Ravenel*, Curtis Herb., 1716 (the type and cotype in Kew Herb. and Curtis Herb. respectively).

11. **C. delitescens** Burt, n. sp. Plate 17. fig. 18.

Type: in Burt Herb.

Fructifications gregarious, cespitose, somewhat fleshy; pileus thin, convex, then umbilicate, dry, fibrillose, sepia-colored, the margin inrolled; stem equal, solid, glabrous, chamois-colored; hymenium even or sometimes obscurely lamelliform, chamois-colored; spores white, even, broadly ovoid, 9 x 7 μ, borne four to a basidium.

Fructification 10–15 mm. high; pileus 5 mm. broad; stem 10–15 mm. long, 1 mm. thick.

Growing among mosses on very thin soil on rocks by waterfall. Vermont. August.

This species is intermediate between *Cantharellus* and *Craterellus* in its hymenial structure, but, as some of the specimens have the hymenium even and bearing mature spores, I include the species in *Craterellus*. The specimens are much smaller than those of *C. calyculus* and have the pileus becoming merely umbilicate. The little fructifications were well concealed among the mosses; I have found them but once.

Specimens examined:

Vermont: Falls of Lana, Lake Dunmore, *E. A. Burt*, type.

12. **C. taxophilus** Thom, Bot. Gaz. **37**: 215–19. *f. 1–8.* 1904. Plate 17. fig. 21.

Illustrations: Thom, *ibid. f. 1–8.*

Type: in Cornell Univ. Herb., 15445.

Fructifications single, rarely gregarious, fleshy-membranaceous, entirely white when young, becoming pallid to ochraceous buff with age, drying cinnamon buff; pileus narrowly obconic, slightly viscid, the apex truncate, plane, or depressed and with a thin margin which is erect or expanded; stem solid, equal or tapering downward, flexuous, pruinose, with scattered white hairs at the base; hymenium even, becoming longitudinally rugose-wrinkled with age or upon drying; spores white, even, subglobose, 3–4 μ in diameter, borne four to a basidium.

Fructifications 1–3 cm. high; pileus 4–9 mm. broad; stem $\frac{1}{2}$–2 cm. long, $\frac{1}{2}$–1 mm. thick.

On rotten twigs and leaves under prostrate branches of *Taxus canadensis*. New York. October and November.

This delicate fungus was under observation by Dr. Thom

for a month and is described in detail and beautifully illustrated in connection with his original description in the work cited above. I reproduce merely some simple outline sketches of *C. taxophilus;* this is a very distinct species. The specimens were found in Fall Creek Gorge and nowhere except under prostrate branches of *Taxus,* yet they grew on rotting twigs and leaves of other species as well as on pieces of *Taxus.*

Specimens examined:

New York: Ithaca, *C. Thom,* Cornell Univ. Herb., 15445.

13. **C. unicolor** Rav. Grevillea 1: 148. 1873.

Plate 16. fig. 11, 12.

C. corrugis Peck, Bull. Torr. Bot. Club **26:** 69. 1899.

Type: in Ravenel, Fung. Car. II. 26.

Fructifications solitary or cespitose, fleshy, with the flesh white, soft, soon shrinking and leaving the pileus hollow; pileus at first clavate, obtuse, flesh-colored tinted with violet, soon obconic or turbinate, broadly convex or truncate, and often abruptly cerebriform at the upper end, glabrous, ochraceous buff, drying Rood's brown to Natal-brown, the margin obtuse, corrugated by the hymenial wrinkles; stem short, equal or tapering downwards, colored like or a little paler than the pileus; hymenium wrinkled or corrugated, colored like the pileus; spores white, 8–12 x 4–6 μ.

Fructifications 2–5 cm. high; pileus $1\frac{1}{2}$–5 cm. broad; stem 1–$2\frac{1}{2}$ cm. long, 5–8 mm. thick.

On ground in thin woods. Massachusetts, Pennsylvania, and South Carolina. October to January.

This fungus presents strikingly the vagaries in the distribution of fungi. It was originally collected at Black Oak, South Carolina, in 1850, by Ravenel, in sufficient quantity so that he distributed the type collection in his exsiccati. Apparently, this fungus, whenever collected, was referred to other species until 1898, when members of the Boston Mycological Club found it in several localities in Massachusetts and it was adequately described by Peck, as *C. corrugis,* from specimens received from Dr. Francis. I have received no specimens of this species since that season; I searched for it in vain for several years in the adjoining state, Vermont. I have compared the specimens of *C. corrugis,* received from Dr. Francis, with Peck's

type and with the specimens of *C. unicolor* in five different copies of Ravenel's 'Fungi Caroliniani.' *C. corrugis* is certainly the same species as *C. unicolor*. It is very strange that in the interval of nearly half a century from the time of the original collection, *C. unicolor* did not attract attention from an intermediate station.

Specimens examined:

Exsiccati: Ravenel, Fung. Car. II. 26; Ell. & Ev., N. Am. Fungi, 1922a under the name *C. pistillaris*.

Massachusetts: Worcester, *G. E. Francis, 61, 84*, and collection dated Nov. 2, also the type (in Coll. N. Y. State) of *C. corrugis;* Lynn, *H. Webster;* Medford, *Mrs. Page and Mrs. De Long*, ex Herb. Boston Mycological Club, 420; Arlington Heights, *E. A. Burt.*

Pennsylvania: Trexlertown, *W. Herbst*, the *C. clavatus* of his 'Fungal Flora'; West Chester, *B. M. Everhart*, Ell. & Ev., N. Am. Fungi, 1922a.

South Carolina: Black Oak, *Ravenel, 1406* (in Curtis Herb. and in Kew Herb.), and type, Ravenel, Fung, Car. II. 26.

14. C. pistillaris Fries, Epicr. 534. 1836–1838.

Plates 16, 17. figs. 13, 14.

Illustrations: Schæffer, Icon. Fung. *pl. 169.*—Harper, Mycologia **5**: 263. *pl. 95.*

Fructifications gregarious, fleshy-spongy, drying sorghum-brown to fuscous; pileus somewhat clavate to turbinate or narrowly obconic, truncate, or somewhat convex, at first yellowish cinnamon, then becoming tinged with fuscous, the edge obtuse; stem solid, paler than the pileus, often bulbous at the base; hymenium corrugated and rugose-wrinkled, colored like the pileus, drying sorghum-brown to fuscous; spores even, 10–12 x 6–8 μ.

Fructifications 6–12 cm. high; pileus 2–3½ cm. broad; stem 3–6 cm. long, 4–12 mm. thick.

On ground in woods under coniferous trees. New Hampshire, Vermont, and Michigan. August to October.

Specimens of this species have so nearly the coloration of *C. unicolor* that those, small and undeveloped, in a collection of *C. pistillaris* cannot readily be distinguished from partially developed specimens of *C. unicolor;* but with age, those of *C.*

unicolor—or at least some of them—have the pileus enlarge abruptly in diameter near the upper end and become abruptly globose-cerebriform on a slender stem, as shown in figs. 11 and 12, while *C. pistillaris* increases in length as well as in diameter, tapers downward more uniformly from the truncate upper end, and may have the stem bulbous at the base.

It is a vexed question with mycologists whether *Craterellus pistillaris* Fr. is *Clavaria pistillaris* L. The specimens which I refer to *Craterellus pistillaris* agree well with specimens of this species in Curtis Herbarium, collected at Upsala, Sweden, in 1853, and communicated by E. P. Fries. Pl. 16 fig. 13 is from a photograph, natural size, of these specimens. Their spores are 9 x 6 μ. The Friesian specimens have the same dark color as our American specimens. Only one of the former shows a bulbous tendency at the base of the stem; in this respect our specimens are more like the illustration of Schæffer, cited above. I believe, therefore, that we have *Craterellus pistillaris* Fr. in our flora. I have collected in mixed frondose woods in Missouri what I refer to *Clavaria pistillaris* as understood by European mycologists. As compared with the former species it is of softer structure, much paler in color, more regularly clavate in form, sometimes splitting at the apex. The illustrations of most European authors agree well in regard to *Clavaria pistillaris*. The colored figures of this species in Batsch, Bulliard, Sturm, Dufour, Flora Danica, Hussey, Krombholz, Quelet, and Sowerby present fructifications of the same habit and bright coloration which we have by Peck, Bull. N. Y. State Mus. **94**: *pl. 93. f. 1–4.* and Mem. N. Y. State Mus. **4**: *pl. 66. f. 15–17.*

Specimens examined:

Sweden: Upsala, *E. P. Fries* (in Curtis Herb.).

Austria: *G. Bresadola.*

New Hampshire: Shelburne, *W. G. Farlow* (in Mo. Bot. Gard. Herb., 4933).

Vermont: Middlebury, *E. A. Burt.*

15. C. palmatus Burt & Overholts, n. sp. Plate 17. fig. 19.

Type: in Mo. Bot. Gard. Herb. and in Overholts Herb.

Fructifications gregarious or perhaps cespitose, fleshy-soft; pileus fawn-color shading into bone-brown towards the stem,

glabrous, flattened and ligulate at first, then spreading out laterally at the apex, and at length somewhat palmately cleft into 2–12 unequal, obtuse, finger-shaped branches; stem curved, solid, equal or somewhat tapering towards the base, bone-brown, sometimes swollen where attached to the substratum; hymenium even or but slightly venose, inferior, colored like the pileus; spores white, even, pyriform, tapering to the base, 6–8 x 3–4 μ.

Fructifications 1–2½ cm. high; pileus 3–15 mm. broad, 1 mm. thick; stem 8–15 mm. long, 1–1½ mm. thick.

On rotten chunks of wood in frondose woods. Ohio. June.

All specimens of the collection except one have the pileus flabelliform; in this exceptional specimen, the pileus is narrowly turbinate, depressed, and with the finger-shaped branches arranged in a circle on the margin, pl. 17 fig. 19b. This species makes for *Craterellus* the same connection between the central-stemmed, cup-shaped type of pileus and the flabelliform type that *Thelephora multipartita* shows in *Thelephora*, and that is common in *Stereum*. The hymenium of the flabelliform specimens of *Craterellus palmatus* is so similar to the upper surface of the pileus in color and consistency that one cannot readily distinguish between these surfaces in the dried specimens. For these reasons, the present species cannot be referred to either *Skepperia* or *Friesula*, and it is of especial interest in showing that *Craterellus* has a natural section of species with flabelliform pileus. The spores of *C. palmatus* are noteworthy.

Specimens examined:

Ohio: Oxford, *L. O. Overholts, 1649*, type (in Mo. Bot. Gard. Herb. and in Overholts Herb.).

16. C. dilatus Burt, n. sp. Plate 17. fig. 16.

Type: in Farlow Herb.

Fructifications single, fleshy; pileus flabelliform, somewhat triangular, glabrous, drying a dirty pinkish buff, the margin somewhat irregularly lobed, crisped, and curving upward; stem solid, equal, flexuous, drying Natal-brown, with white mycelium at the base; hymenium even, drying Isabella-color to clay-color; spores white, even, broadly ovoid, obtuse, 8–10 x 6–7 μ.

Dried fructification 4 cm. long; pileus 15 mm. long, 15 mm. broad, ½ mm. thick; stem 2½ cm. long, hardly 1 mm. thick.

On sandy ground in swamp. Florida. September.

Only a single fructification was collected; the description is based upon this dried specimen. The species is distinguished by its fan-shaped, triangular pileus and the comparatively long and slender stem. Its characters are those of a true *Craterellus* and yet such that we cannot regard it as a flabellate form of any other species.

Specimens examined:

Florida: Sorrento Swamp, *R. Thaxter*, type (in Farlow Herb.).

17. **C. Humphreyi** Burt, n. sp. Plate 17. fig. 22.

Type: in Burt Herb. and in Humphrey Herb.

Fructifications gregarious, fleshy, moderately tough and flexible, entirely white, usually with the pileus standing out horizontally at the apex of the erect stem; pileus reniform, dimidiate, sometimes clasping behind, convex, becoming plane or somewhat depressed, usually even, dry, minutely pubescent, the margin entire, even or slightly crisped; stem lateral, erect, often bent at right angles just before joining the pileus, cylindric below, equal, solid, pubescent; hymenium nearly even, sometimes radiately venose near the stem, brittle when fresh; spores white, even, subglobose, $3\frac{1}{2}$–$4\frac{1}{2}$ x $3\frac{1}{2}$ μ.

Fructifications 3–7 cm. high; pileus 6 mm. – 2 cm. long, 1–$3\frac{1}{2}$ cm. broad, $\frac{3}{4}$ mm. thick; stem $2\frac{1}{2}$–6 cm. long, 2 mm. thick.

On humus and among mosses in low swampy thicket. Washington. October.

The habit of this curious species is very suggestive of *Hydnum auriscalpium;* many of the specimens have the erect stem bent at right angles near the apex so that the pileus extends out in a horizontal plane. Sometimes the stem branches at its upper end and bears two pilei. The pubescence on the stem is rather coarse and is most abundant towards the base. All parts of the fructification were rather brittle in vegetative condition, and broke when bent too far. It is a connecting species between *Craterellus* and *Arrhenia*, but with the hymenium rather too even for *Arrhenia*, in my opinion.

Specimens examined:

Washington: Hoquiam, *C. J. Humphrey, 1386*, type.

Berkeley & Curtis, Jour. Linn. Soc. Bot. **10**: 328, described three species of *Craterellus* from Cuba, which have been transferred to other genera by Patouillard, Bull. Soc. Myc. France **15**: 193–94. *pl. 9*, as follows: *C. spathularius* to *Skepperia* and *C. marasmioides* and *C. pulverulentus* to *Cymatella*. I have received no collections referable to these genera and defer their consideration to the final part of my monograph in the hope that some specimens may be received in the meantime.

Craterellus canadensis Kl. ex Saccardo, Syll. Fung. **6**: 519. 1888, was published by Berkeley, Ann. Nat. Hist. **3**: 380. 1839, under the name *Cantharellus canadensis* Kl. from a specimen in Hooker Herb. bearing manuscript notes by Klotzsch. The specimen was collected in Canada by Richardson. In connection with the original description, Berkeley noted that the nearest affinities of *C. canadensis* are with *C. clavatus*. In 1856, after studying the specimens in Herb. Schweinitz, Berkeley & Curtis, Jour. Acad. Nat. Sci., Phila. N. S. **3**: 206. 1856, note that *Cantharellus canadensis* Kl. is apparently the same species as *Cantharellus floccosus* Schw. I have seen no specimens of *C. canadensis* and follow Berkeley's final disposition of the species.

(To be continued.)

Explanation of Plate

PLATE 15

All figures of this plate have been reproduced natural size from photographs of dried herbarium specimens.

Fig. 1. *Thelephora cæspitulans.* From authentic specimen in Curtis Herb., collected by Schweinitz in North Carolina.

Fig. 2. *T. lutosa.* From authentic specimen in Curtis Herb., collected by Schweinitz in North Carolina.

Fig. 3. *T. dentosa.* From cotype in Curtis Herb., collected in Cuba by C. Wright.

Fig. 4. *T. perplexa.* From type in Curtis Herb., collected in Cuba by C. Wright, 238. *a* shows a resupinate portion, and *b*, an ascending portion of the specimen.

Fig. 5. *T. cornucopioides.* From specimen collected in Castleton Gardens, Jamaica, by F. S. Earle, 238.

Fig. 6. *Craterellus clavatus.* From specimen collected at Lake Dunmore, Vt.

Fig. 7. *C. Cantharellus.* From the cotype in Curtis Herb., 4539, of *C. lateritius*, collected in Alabama, by Peters.

Fig. 8. *C. odoratus.* From the cotype in Curtis Herb. of *C. confluens*, collected near Orizaba, Mexico, by Botteri, 6.

Fig. 9. *C. odoratus.* From the specimens in Curtis Herb., collected at Society Hill, S. Carolina, by Ravenel, 192.

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1. THELEPHORA CAESPITULANS. — 2. T. LUTOSA. — 3. T. DENTOSA. — 4. T. PERPLEXA — 5. T. CORNUCOPIOIDES. — 6. CRATERELLUS CLAVATUS. — 7. C. CANTHARELLUS. — 8 AND 9. C. ODORATUS.

Explanation of Plate

PLATE 16

All figures of this plate have been reproduced natural size from photographs of dried herbarium specimens, but in the case of fig. 10 the specimens were moistened.

Fig. 10. *C. odoratus*. From specimens collected near St. Louis, Mo., by N. M. Glatfelter, 348. The rough dried specimens were moistened before being photographed. *a* shows a branched specimen; *b*, a fructification split longitudinally to show extent of depression of the pileus and the hollow stem; *c*, view of hymenium.

Fig. 11. *C. unicolor*. From authentic specimen in Curtis Herb., collected at Black Oak, S. Carolina, by Ravenel, 1406.

Fig. 12. *C. unicolor*. From specimen of *C. corrugis* collected at Medford, Mass., by Mrs. Page and Mrs. DeLong.

Fig. 13. *C. pistillaris*. From specimen in Curtis Herb., collected at Upsala, Sweden, by E. P. Fries.

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10. CRATERELLUS ODORATUS. — 11 AND 12. C. UNICOLOR. — 13. C. PISTILLARIS.

Explanation of Plate

PLATE 17

All figures are natural size. Figures 14–20 are from photographs of dried herbarium specimens, but which were moistened before being photographed in case of specimens used for figs. 15 and 17.

Fig. 14. *C. pistillaris.* From specimen collected under hemlock (*Tsuga*) tree, at Middlebury, Vt.

Fig. 15. *C. ochrosporus.* From type specimens in Mo. Bot. Gard. Herb., collected near St. Louis, Mo., by N. M. Glatfelter, 1253. *a* is split longitudinally to show the depth of depression of the pileus; *b*, side view.

Fig. 16. *C. dilatus.* From type in Farlow Herb., collected at Sorrento Swamp, Florida, by R. Thaxter. *a* shows upper surface of pileus, and *b*, the hymenium.

Fig. 17. *C. cornucopioides.* From specimen collected in Canada, by J. Macoun, 72.

Fig. 18. *C. delitescens.* From type specimens collected at Lake Dunmore, Vt.

Fig. 19. *C. palmatus.* From type specimens in Mo. Bot. Gard. Herb. and Overholts Herb., collected at Oxford, Ohio, by L. O. Overholts, 1649. *a* shows specimens having flabelliform pileus, and *b*, a specimen with turbinate pileus.

Fig. 20. *C. lutescens.* *a* shows hymenium of specimen collected at Shelburne, New Hampshire, by W. G. Farlow, and *b*, upper surface of specimen collected at Lake Dunmore, Vt.

Fig. 21. *C. taxophilus.* From sketches of photographs of type specimens when in vegetative condition, collected at Ithaca, New York, by C. Thom.

Fig. 22. *C. Humphreyi.* From sketches of the type specimens when in vegetative condition, collected at Hoquiam, Wash., by C. J. Humphrey, 1386.

BURT — THELEPHORACEAE OF NORTH AMERICA

14. CRATERELLUS PISTILLARIS. — 15. C. OCHROSPORUS. — 16. C. DILATUS. — 17. C. CORNUCOPIOIDES. — 18. C. DELITESCENS. — 19. C. PALMATUS. — 20. C. LUTESCENS. — 21. C. TAXOPHILUS. — 22. C. HUMPHREYI.

The Thelephoraceæ of North America. III.

Craterellus borealis and Cyphella

EDWARD ANGUS BURT

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THE THELEPHORACEÆ OF NORTH AMERICA III[1]

Craterellus borealis and Cyphella

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Since the publication of Part II, on *Craterellus*, Dr. Farlow has very kindly called my attention to, and permitted me to study, a specimen of a rare species from Labrador which was not included in my account of our North American species. This species is now described here so as to bring its description and illustration continuous with those of our other species of *Craterellus*.

The following is suggested for insertion in "Key to the Species," on page 328 (Ann. Mo. Bot. Gard. 1: 328. 1914).

6. Pileus membranaceous, infundibuliform, pale buff; hymenium pale buff; spores 5–7 x 4–5½ μ; from Labrador. See page 357 (Ann. Mo. Bot. Gard. 1: 357. 1914) ..... *C. borealis*

Craterellus borealis Burt, n. sp. Plate 19. fig. 1.

Type: in Farlow Herb.

Fructifications solitary, small; pileus infundibuliform, tapering uniformly to the stem, glabrous, drying between cartridge buff and cream-buff, the margin entire; stem nearly equal,

Note.—Explanation in regard to the citation of specimens studied is given in Part I, Ann. Mo. Bot. Gard. 1: 202. 1914, footnote. The technical color terms used in this work are those of Ridgway, Color Standards and Nomenclature. Washington, D. C., 1912.

[1] Issued January 30, 1915.

slender, minutely downy, pale mouse-gray; hymenium colored like the pileus, remotely ribbed, with the ribs radiating from the stem, thin, branching; spores colorless, even, 5–7 x 4–5½ μ.

Fructification 2 cm. high; pileus 1 cm. broad, 13 mm. long; stem 7 mm. long, ½ mm. thick, enlarging to 1 mm. where joining the pileus.

In moss. Labrador. August 8, 1908.

The above description is based on the single dried specimen collected by the Bryant Labrador Expedition. The small size, regular obconic form, and very pale color of the membranaceous pileus and the slender stem are characters making *C. borealis* clearly distinct from other species of *Craterellus*.

Specimens examined:

Labrador: Gready Harbor, Gready Island, *Owen Bryant*, type (in Farlow Herb.)

CYPHELLA

Cyphella Fries, Syst. Myc. **2**: 201. 1823.

Fructifications somewhat membranaceous, cup-shaped, rarely plane, adnate behind, commonly extended in stem-like form, pendulous; hymenium typically concave or disk-shaped, definitely inferior in the pendulous species, even or at length rugulose; basidia typically four-spored; spores subovate or globose, hyaline, rarely colored.

C. digitalis Fries is the type species of this genus.

The fructifications of all our North American species are comparatively small, ranging in diameter from a fraction of a millimeter for some species to five to fifteen millimeters for those of the largest species. The fructifications are produced on the bark of small rotting twigs on the ground and on dead herbage, and can only be distinguished from small *Peziza* by demonstrating basidia rather than asci in the hymenium. This demonstration is simply made by crushing under a cover glass a portion of a fructification in water containing a little seven per cent solution of potassium hydrate, and then examining the preparation with the compound microscope. The basidia are usually four-spored; in a few species I have as yet been able to detect only two-spored basidia.

Cyphella is closely related to *Solenia* by such species as *C. fasciculata* and *C. mellea*, but is separated from it in such cases

by the absence of a hyphal subiculum over the area on which the fructifications are distributed, and by the less cylindric form of fructifications of *Cyphella*. *Cyphella* is allied to *Merulius* by *C. muscigena* and also to *Craterellus* by this species, specimens of which were described as a *Craterellus*.

A few species of *Cyphella* are common and widely distributed, but most of our North American species are apparently extremely local and are known only from their respective type collections. The lack of specimens available for carrying about to compare with types has been a serious disadvantage in my study of this genus. Basidia and basidiospores have not as yet been found for some species which, although originally referred to *Cyphella*, have to be regarded as even doubtful *Basidiomycetes*. I have supplemented the original descriptions with measurements of dried fructifications and with such data in regard to basidia and spores as the specimens afford. In the case of very scanty types, the few fructifications are too precious for gross comparison to be used for microscopic study. For such species, it seems to me that the descriptions should stand on the original data, without prejudice, until new collections become available. Such imperfectly known and partially described species are grouped together under the heading "Species Imperfectly Known." *Cyphella convoluta* Cke., *C. Cupressi* (Schw.) Fries and *C. subcyanea* Ell. & Ev. are excluded species.

Key to the Species

Fructifications sulphur-colored; hymenium even; spores 4½x2½–3 μ *1. C. sulphurea*
Fructifications sulphur-colored; hymenium minutely pitted; spores 6–8 x 3–4 μ ..... *2. C. læta*
Fructifications white or whitish; on mosses 1
Fructifications white; not on mosses 2
Fructifications neither white nor sulphur-colored 3
1. Fructifications helmet-shaped; hymenium slightly wrinkled; spores 10 x 8 μ ..... *3. C. galeata*
1. Fructifications flattened, irregular in form, sometimes stipitate; spores 3–5 x 2–3 μ ..... *4. C. muscigena*
1. Fructifications seated upon or developing from webby strings of mycelium *5. C. arachnoidea*
2. Fructifications villose, not easily crushed, with a firm base or a short stem; spores 12–18 x 6–6½ μ ..... *6. C. Tiliæ*
2. Fructifications villose, easily crushed, sessile; spores 10–12 x 5–7 μ *7. C. villosa*
2. Fructifications whitish, minutely webby-hairy, easily crushed, sessile; spores 8–13 x 4 μ ..... *8. C. caricina*

2. Fructifications glabrous, with an oblique stem; spores 4½–6 x 3–3½ μ ..... *9. C. capula*
2. Fructifications villose, snow-white, sessile, very minute and delicate; spores 5–6 x 4–4½ μ; from New England ..... *10. C. minutissima*
2. Compare with *C. cinereo-fusca*, *C. Palmarum*, *C. Peckii*, *C. perexigua*, *C. pezizoides* and *C. trachychæta* of "Species Imperfectly Known."
3. Fructifications wholly pale ivory-yellow, downy-pubescent, cup-shaped, sessile; spores 4–7 x 3–4 μ ..... *11. C. Langloisii*
3. Fructifications wholly cream-color, not hairy, helmet-shaped, sessile, resupinate-reflexed; hymenium wrinkled; spores 7½ x 4½ μ; on prickle-bearing stems, Jamaica ..... *12. C. porrigens*
3. Fructifications mineral-gray, tomentose, cup-shaped, sessile; hymenium fuscous; spores angular, 4½–6 x 4½ μ; on *Juniperus* ..... *13. C. cupulæformis*
3. Fructifications wholly gray-pallid, flocculose, sessile; spores 4 x 3 μ ..... *14. C. griseo-pallida*
3. Fructifications externally cinereous, farinaceous, flattened, sessile; hymenium convex, brown; spores 8 x 3½ μ; on *Alnus* ..... *15. C. subgelatinosa*
3. Fructifications darker colored than the above 4
4. Fructifications vinaceous-buff, hairy, sessile, ⅓ mm. broad; spores 10–12 x 6–8 μ; on bark of *Carya* ..... *16. C. Ravenelii*
4. Fructifications drying Isabella-color, hairy, sessile, 1–1½ mm. broad; spores 13 x 8 μ; on *Quercus* ..... *17. C. texensis*
4. Fructifications Isabella-color, hairy, sessile, ⅕–½ mm. broad; some spores colored, 5–6 x 4–4½ μ; on *Salix* ..... *18. C. mellea*
4. Fructifications tawny-olive, tomentose, stipitate; often cespitose; spores 7–9 x 2–2½ μ; usually on *Alnus* ..... *19. C. fasciculata*
4. Fructifications fuscous when moist, drying mouse-gray, cespitose and sessile on a common short trunk, glabrous, structure gelatinous *20. C. conglobata*
4. Fructifications sepia or olive-brown, cup-shaped, probably glabrous, sessile or with a very short stem; spores 6–8 x 3½–4 μ; on rotting leaves of *Gladiolus* ..... *21. C. fumosa*
4. Compare *C. Bananæ*, *C. filicicola* and *C. musæcola* in "Species Imperfectly Known."

1. **C. sulphurea** Batsch ex Fries, Hym. Eur. 665. 1874.

Peziza sulphurea Batsch, Elenchus Fung. Contin. 1: 209. *pl. 27. f. 146.* 1786.—*P. campanula* Nees, System d. Pilze 268. *f. 295.* 1816.—*Cyphella sulphurea* Batsch, in Patouillard, Tab. Anal. Fung. 114. *f. 256.* 1883; Peck, Rep. N. Y. State Mus. 31: 38. 1879.

Illustrations: Batsch, Elenchus Fung. Contin. *pl. 27. f. 146.* —Nees, System d. Pilze *f. 295.*—Patouillard, Tab. Anal. Fung. *f. 256.*—Oudemans, Ned. Kruidk. Archief III. 2: *pl. 3. f. 1–5.*

Fructifications scattered or gregarious, membranaceous, broadly campanulate, somewhat irregular, extended into a short stem, even, glabrous, sulphur-yellow, the margin somewhat repand; hymenium even; basidia cylindric, 16 x 4½ μ, 4-spored;

spores colorless, even, broadly ovoid, somewhat flattened on one side, $4\frac{1}{2}$ x $2\frac{1}{2}$–3 μ.

Fructifications about 2–3 mm. high; pileus 1–2 mm. broad; stem 1 mm. long, $\frac{1}{4}$ mm. thick.

On living stems of herbs in damp places. New York. September. Rare.

The minimum dimensions given above for the fructifications are about those of European specimens of this species as figured; the American specimens run rather larger in Peck's collection. Peck noted that some of his specimens were white when collected, but that they dried yellow like the others of the collection. In other respects our American specimens agree closely with the figures and description of European specimens. Oudemans gives the spore dimensions as 10–12 x 4–5 μ, but Patouillard gives them as they are in American specimens.

Specimens examined:

New York: Griffins, Delaware Co., *C. H. Peck* (in Coll. N. Y. State).

2. C. læta Fries, Epicr. 568. 1836–1838.

Illustrations: Patouillard, Tab. Anal. Fung. *f. 362.*

Fructifications membranaceous, obliquely cup-shaped, extended at the vertex into a stem, pendulous, entire, everywhere glabrous and sulphur-colored; stem straight or somewhat flexuous, hymenium minutely pitted; spores colorless, even, 6–8 x 3–4 μ, borne four to a basidium.

Fructifications 3–5 mm. high, 2–4 mm. broad; stem 1–2 mm. long, about $\frac{1}{2}$ mm. thick.

On dead stems of large herbs lying on the ground. New York. August.

Fries described the fructifications as 6–8 mm. broad; the dimensions given above are those of Patouillard's figures and of the specimens collected by Peck. Patouillard notes that the specimens blacken when old; Peck states, "The beautiful sulphur-color is lost in drying." The pitted surface of the hymenium is a noteworthy character of *C. læta* and this and the larger spores of *C. læta* distinguish it from *C. sulphurea.*

Specimens examined:

New York: East Berne, *C. H. Peck* (in Coll. N. Y. State).

3. **C. galeata** Schum. ex Fries, Epicr. 567. 1836–1838.

Plate 19. fig. 2.

Merulius galeatus Schum. Plant. Sællandiæ 2: 371. 1803.—*Cantharellus galeatus* Fries, Syst. Myc. 1: 524. 1821; Flor. Dan. 12: fasc. 34. 11. *pl. 2027. f. 1.* 1830.

Illustrations: Flor. Dan. *pl. 2027. f. 1.*

Fructifications membranaceous-soft, somewhat sessile, obversely cup-shaped and then dimidiate, helmet-shaped, even, whitish, the margin entire; hymenium at length rufescent, slightly wrinkled; spores ovate or obovate, 10 x 8 μ.

Fructifications 4–15 mm. in diameter.

On mosses. Ohio.

When young entire, cup-shaped; gray when moist, snow-white when dry, then rufescent. The above description is that given in European works. The species has been reported from Ohio by Morgan but I have not studied his specimens nor any European specimens of this species. The form and coloration of the pileus and the large spores should distinguish *C. galeata* from the other species which occur on mosses in North America.

4. **C. muscigena** Pers. ex Fries, Epicr. 567. 1836–1838.

Plate 19. fig. 3.

Thelephora muscigena Pers. Syn. Fung. 572. 1801; Fries, Syst. Myc. 1:524. 1821.—*T. vulgaris* α *candida* Pers. Myc. Eur. 1:115. *pl. 7. f. 6.* 1822.—*Cantharellus lævis* Fries, Syst. Myc. 1:524. 1821; Elenchus Fung. 55. 1828.—*Craterellus Pogonati* Peck, Bull. Torr. Bot. Club 33: 218. 1906.

Illustrations: Persoon, Myc. Eur. 1: *pl. 7. f. 6.*—Patouillard, Tab. Anal. Fung. *f. 465.*—Oudemans, Ned. Kruidk. Archief III. 2: *pl. 11. f. 2.*

Pileus membranaceous-soft, sessile, stipitate or attached by upper surface, irregular, flattened, white, externally minutely tomentulose or silky under a lens; stem when present lateral or eccentric, slender, white; hymenium even or sometimes rugulose, drying pinkish buff; spores white in collection on slide, even, apiculate at base, flattened on one side, 4½–5 x 2½–3 μ but only 3–4½ x 2–3 μ in preparations of the hymenium, borne four to a basidium.

Pileus 2–6 mm. in diameter; stem when present 3–5 mm. long, ½ mm. thick.

On *Polytrichum* and other mosses. New England and New York. August and September.

The fructifications are very variable in form and they are attached in various ways to the moss plants; they may be somewhat incrusting but at some distance above the ground. The substance of the pileus is very soft and its upper surface is somewhat bibulous and shows its interwoven fibers under a lens. The spores of this species are given in Saccardo's 'Sylloge' as 8–10 x 5 μ, but the European specimens of exsiccati cited below have small spores of the dimensions which I give for American specimens, and Bresadola, Ann. Myc. 1: 111. 1903, gives the spore dimensions as 3–4 x 3 μ. The specimens of *C. Pogonati* were described as sterile by Peck; I find them to be rather immature but bearing spores 3 x 2 μ.

Specimens examined:

Exsiccati: Karsten, Fung. Fenn., 441; Krieger, Fung. Sax., 1564.
Finland: *Karsten* (in Herb. Fries), and Fung. Fenn., 441.
Germany: Saxony, *W. Krieger*, Krieger, Fung. Sax., 1564.
Vermont: near Falls of Lana, Salisbury, *E. A. Burt.*
Connecticut: South Windsor, *C. C. Hanmer, 1956*, the type collection of *Craterellus Pogonati* Pk.
New York: Floodwood, *E. A. Burt.*

5. C. arachnoidea Peck, Rep. N. Y. State Mus. 44: 134 (22). 1891.

Type: in Collection New York State.

Fructifications membranaceous, very thin, tender, white, externally downy, irregularly cup-shaped; hymenium somewhat uneven in large specimens; spores colorless, even, somewhat flattened on one side, 4–5 x 3½–4 μ, borne at least two to a basidium.

Fructifications 2–4 mm. in diameter.

On bark and mosses. Vermont and New York. September.

The cups are seated upon or developing from fine, white, loosely branching, webby strings of mycelium. This is a marked character in the type and is the chief character for separating this species from *C. muscigena*. The spores are slightly more globose than in the latter and it may be that the hymenium of *C. arachnoidea* is superior; in *C. muscigena* it is inferior. The hyphæ are about 2 μ in diameter in each species.

Specimens examined:
Vermont: South Lincoln Notch, near Middlebury, *E. A. Burt.*
New York: Carrollton, *C. H. Peck*, type (in Coll. N. Y. State).

6. C. Tiliæ Peck ex Cooke, Grevillea **20**: 9. 1891.

Plate 19. fig. 16.

Peziza Tiliæ Peck, Rep. N. Y. State Mus. **24**: 96. 1872.—*Trichopeziza Tiliæ* (Peck) Sacc. Syll. Fung. **8**: 428. 1889; Seaver, Proc. Iowa Acad. Sci. **12**: 116. 1905; Mycologia **1**: 110. 1909.

Type: in Collection New York State and a portion from it in Kew Herbarium.

Fructifications gregarious, rather fleshy, minute, sessile or nearly so but with firm base, white, globose, then expanded and concave, drying cup-shaped, densely white villose; hairs straight, cylindric, granular incrusted, 200 x 6 μ; hymenium concave, even, ivory-yellow to vinaceous buff; spores white in a collection on a slide, simple, even, ovate, somewhat curved, 12–18 x 6–6½ μ, borne four to a basidium.

Fructifications ½–1 mm. high, ⅓–1 mm. broad; stem, when present, about one-half the height of the whole fructification.

On bark of dead branches of *Tilia Americana* and *Ulmus* on the ground. Canada and Vermont westward to Missouri. March to October. Probably common.

C. Tiliæ has somewhat the habit of *C. albo-violascens* but differs from the latter in having no violaceous tints, in being more hairy, in having slenderer spores, and in having at the base a very firm tubercle which offers considerable resistance when the fructification is crushed under a cover glass or sectioned. While not cespitose the fructifications of *C. Tiliæ* are often so near together that seven or eight have been counted on an area a centimeter square. I refer to *C. Tiliæ* many American specimens which have been distributed under the name *C. pezizoides* Zopf. The European specimens which Sydow has distributed under the latter name seem to me from the studies and comparisons which I made in Kew Herbarium to be *C. Curreyi* B. & Br. rather than *C. Tiliæ.*

Specimens examined:
Exsiccati: Shear, N. Y. Fungi, 55; Ell. & Ev., N. Am. Fungi, 2316a, under the name *C. pezizoides;* Ell. & Ev., Fung.

Col., 5, under the name *C. pezizoides;* Rabenhorst, Fung. Eur., 3942, under the name *C. pezizoides.*

Quebec: Hull, *J. Macoun, 672.*

Ontario: Ottawa, *J. Macoun, 318, 430;* London, *J. Dearness,* Ell. & Ev., N. Am. Fungi, 2316a, and Fung. Col., 5.

Vermont: Middlebury, *C. O. Smith,* and also *E. A. Burt.*

New York: Knowersville (Altamont), *C. H. Peck,* type (portion in Kew Herb.); Alcove, *C. L. Shear,* Shear, N. Y. Fungi, 55.

Ohio: Oberlin, *F. D. Kelsey* (in Mo. Bot. Gard. Herb., 4942).

Michigan: Agricultural College, *G. H. Hicks,* comm. by W. G. Farlow, 6 (in Mo. Bot. Gard. Herb., 43807).

Wisconsin: Blue Mounds, *I. E. Melhus,* comm. by C. J. Humphrey, 2410 (in Mo. Bot. Gard. Herb.).

Missouri: *C. H. Demetrio,* Rabenhorst, Fung. Eur., 3942.

7. C. villosa Pers. ex Karsten, (Mycol. Fenn. 3) Bidrag Finska Vet.-Soc. **25**: 325. 1876. Plate 19. fig. 13.

Peziza villosa Pers. Syn. Fung. 655. 1801; Fries, Syst. Myc. **2**: 104, pr. p. 1823.—An *Cyphella pezizoides* Zopf, in Morgan, (Myc. Fl. Miami Val.) Jour. Cincinnati Soc. Nat. Hist. **10**: 202. 1888?

Illustrations: Patouillard, Tab. Anal. Fung. *f. 257.*

Fructifications gregarious, membranaceous, sessile, drying globose or obconic and with the pore nearly closed by the hairs, white, externally white-villose; the hairs granular incrusted, cylindric, 200 x 5–6 μ; hymenium even, concave; spores hyaline, even, ovoid, flattened on one side, broadest near the base, 10–12 x 5–7 μ.

Fructifications about $\frac{1}{5}$ mm. high, $\frac{1}{5}$–$\frac{1}{4}$ mm. broad.

On dead stems of *Artemisia, Helianthus,* and *Solidago.* South Carolina, Missouri and California. June and July.

The fructifications of *C. villosa* resemble those of *C. Tiliæ* in form, color, and hairiness but are much smaller than those of *C. Tiliæ,* more membranaceous and easily crushed under a cover glass, and have smaller spores. The hymenium is very pale with not more than a very slight yellowish tint.

Specimens examined:

Exsiccati: Krieger, Fung. Sax., 1457; Ravenel, Fung. Am., 459; Ell. & Ev., N. Am. Fungi, 2316b, under the name *Cyphella pezizoides* Zopf.

South Carolina: Aiken, *Ravenel*, Ravenel, Fung. Am., 459.

Missouri: Emma, *C. H. Demetrio*, Ell. & Ev., N. Am. Fungi, 2316b.

California: Half-moon Bay, San Mateo Co., *E. B. Copeland*, Baker, Pacific Coast Fungi, 3611 (in Mo. Bot. Gard. Herb., 4944).

8. **C. caricina** Peck, Rep. N. Y. State Mus. **33**: 22. 1880. Plate 19. fig. 8.

Type: in Collection New York State.

Fructifications scattered, membranaceous, sessile, wholly white, externally minutely webby-hairy; hymenium glabrous, uneven in large specimens; basidia cylindric, 20 x 5 μ, 4-spored; spores colorless, even, lanceolate or subclavate, pointed at base, 8–13 x 4 μ.

Fructifications 1–2 mm. broad.

On culms and leaves of carices. New York. August.

The spores of the type are noteworthy by their tapering base.

Specimens examined:

New York: Verona, *C. H. Peck*, type (in Coll. N. Y. State).

9. **C. capula** Holmsk. ex Fries, Epicr. 568. 1836–1838. Plate 19. fig. 4.

Peziza Capula Holmsk. Nov. Act. Havn. **1**: 286. *f. 7;* Fung. Dan. **2**: 41. *pl. 22.* 1899.

Illustrations: Holmskiold, Nov. Act. Havn. **1**: 286. *f. 7;* Fung. Dan. **2**: *pl. 22.*—Flor. Dan. **33**: *pl. 1970. f. 3.*—Patouillard, Tab. Anal. Fung. **1**: *f. 35.*

Fructifications membranaceous, obliquely campanulate, extended into an oblique stem, glabrous, whitish, the margin sinuate, irregularly shaped; hymenium even. . . . On dead stems of herbaceous plants.

—Translation of description in Fries' 'Epicrisis.'

Fructifications in the figures of Holmskiold 4–9 mm. high; pileus 2–7 mm. long, 2–4 mm. broad; stem 1–2 mm. long.

On dead stems of *Fœniculum* and other herbs. New York and South Carolina.

I have not been able to study any European specimens of this species. In the copy of Cooke's 'Fungi Britannici' in the herbarium of the Missouri Botanical Garden the packet labeled *C. capula*, 112, contains only some pieces of stubble. The Amer-

ican specimens distributed in Ravenel's 'Fungi Americani,' 458, were determined by Cooke. In their present dried condition these specimens agree well with Holmskiold's illustrations in form; the stem of these specimens is now hair-brown and the pileus pale olive-buff; their dimensions are: fructifications 1–3 mm. long, pileus ½–2 mm. long and broad; stem ⅓–1 mm. long x 100 μ thick. The basidia are 16–20 x 3½–4½ μ; spores colorless, even, flattened on one side, 4½–6 x 3–3½ μ.

Specimens examined:

Exsiccati: Ravenel, Fung. Am., 458.

South Carolina: Aiken, *Ravenel*, Ravenel, Fung. Am., 458.

10. **C. minutissima** Burt, n. sp. Plate 19. fig. 5.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructifications gregarious, very minute, membranaceous and very delicate, sessile, globose, snow-white, externally villose, often with mouth oblique, margin inrolled; hairs white, incrusted, 75–90 x 4 μ; hymenium concave, white; basidia clavate, 16 x 4 μ; spores colorless, even, 5–6 x 4–4½ μ.

Fructifications 200–500 μ broad, about 200–500 μ high.

On inner bark of *Populus*. New Hampshire: August.

The characters of this species agree in some details with those in the incomplete description of *C. globosa* Pat., the specimens of which were collected on the under side of leaves of ferns in Ecuador by von Lagerheim, but as no mention is made of spore characters for *C. globosa* and as other species of *Cyphella* have not been found to vary widely with regard to kind of substratum, it seems best to regard our New England species as probably distinct. *C. punctiformis* (Fries) Karst. is a small white *Cyphella*, described by Karsten as having spores 5–8 x 2–4 μ; I have not been able to study authentic specimens of *C. punctiformis*, but comparison of *C. minutissima* with this species of northern Europe should be made.

I refer to *C. minutissima* a collection made by myself in Vermont on bark of rotting locust limbs. The fructifications of this collection lack spores but agree in all other respects with the type.

Specimens examined:

New Hampshire: Chocorua, *W. G. Farlow, 3*, type (in Mo. Bot. Gard. Herb., 43803, and in Farlow Herb.).

Vermont: Middlebury, *E. A. Burt.*

11. **C. Langloisii** Burt, n. sp. Plate 19. fig. 6.

Type: in Farlow Herb. and Burt Herb.

Fructifications gregarious, membranaceous, cup-shaped, sessile, drying pale ivory-yellow, externally downy pubescent, the margin inrolled; hairs colorless, somewhat crinkled together, granular incrusted, 100–150 x 3½–4½ μ; hymenium concave, even, pale ivory-yellow to cream color; spores colorless, even, pointed at the base, 4–7 x 3–4 μ; basidia clavate, 20 x 5μ, 2-spored.

Fructifications about ¼ mm. high; ¼–½ mm. broad.

On dead stems of *Arundinaria* and on decaying pieces of wood lying on the ground. Louisiana. September and April.

The fructifications of *C. Langloisii* are about as small as those of *C. minutissima* but differ from them in being somewhat extended laterally and occasionally somewhat laterally confluent rather than always globose, in having an ivory-yellow rather than snow-white color, and in having the hymenium colored and the hairs longer than in *C. minutissima*. Comparison should be made with *C. fraxinicola* B. & Br., of which I have studied no specimens but which seems distinct by some characters of the incomplete published description.

Specimens examined:

Louisiana: St. Martinville, *A. B. Langlois, 1802*, type (in Farlow Herb.), and *cz*, type, in Burt Herb., and *cy*, and from the same collector but comm. by W. G. Farlow, 5 (in Mo. Bot. Gard. Herb., 43791).

12. **C. porrigens** Burt, n. sp. Plate 19. fig. 7.

Type: in Burt Herb. and New York Bot. Gard. Herb.

Fructifications scattered, membranaceous, thin, wholly cream-color, sessile, obversely cup-shaped or helmet-shaped, resupinate by the upper surface of one side but with the greater portion of the pileus extended and reflexed; hymenium inferior, somewhat wrinkled when moistened, concave, basidia clavate, 20–25 x 4–4½ μ, with four sterigmata; spores colorless, even, flattened on one side, obovate, 7½ x 4½ μ.

Fructifications ½–1 mm. broad.

On dead prickle-bearing stems, possibly *Rubus sp.* Wet mountainous region at altitude 4500–5200 feet. Cinchona, Jamaica. About January 1.

This species does not appear closely related to any other

species; it is marked by the resupinate-reflexed habit of most fructifications; only rarely is a fructification attached by its vertex. The dried specimens are externally minutely fibrillose under a lens but do not show hairs in microscopic preparations. When the fructifications are moistened the hymenium shows two or three minute wrinkles radiating from an eccentric point.

Specimens examined:

Jamaica: Cinchona, *W. A. and Edna L. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 607, type.

13. C. cupulæformis Berk. & Rav. Grevillea **2**: 5. 1873. Plate 19. fig. 9.

Type: type and cotype in Kew Herb. and in Curtis Herb. respectively.

Fructifications scattered, rarely in clusters of two or three, sessile, cup-shaped, somewhat globose, externally mineral gray and obscurely tomentose, the margin incurved; hymenium concave, even, fuscous; basidia clavate, 20–25 x 4–6 μ, having 2–4 sterigmata which become finely attenuated; spores colorless, angular, $4\frac{1}{2}$–6 x $4\frac{1}{2}$ μ.

Fructifications $\frac{1}{2}$ mm. high, $\frac{1}{2}$–1 mm. broad.

On bark of *Juniperus virginiana.* South Carolina and Georgia.

The hairiness of the exterior of the pileus is due to the irregularly curved and interwoven hyphæ which form the surface layer of the pileus; these hyphæ are colorless and about 3 μ in diameter, and they bear scattered but large incrusting granules. The angular spores of this species are often octahedral in form and are noteworthy for *Cyphella;* at maturity, they are attached to the basidium by sterigmata becoming 6 μ long and so finely attenuated that the attachment of the spores to the basidia is made out with difficulty. This species may be readily known by its occurrence on bark of *Juniperus virginiana* and by its angular spores.

Specimens examined:

Exsiccati: Ravenel, Fung. Am., 224.

South Carolina: *Ravenel, 1403,* type (in Kew. Herb.).

Georgia: Darien, *Ravenel,* Ravenel, Fung. Am., 224.

14. C. griseo-pallida Weinm. Hymeno- et Gastero-mycetes in Rossico. 522. 1836.

Illustrations: Patouillard, Tab. Anal. Fung. *f. 255.*

Fructifications gregarious, adnate-sessile, membranaceous, wholly gray-pallid, externally flocculose; hymenium glabrous, even.

At first having the form of globose, closed granules, soon open, campanulate or crateriform, often dimidiate in old stages.

Fructifications ½ mm. high, ½–2 mm. broad.

On moist ground and on pine wood thinly covered with earth and on old cracked trunks of *Lonicera tartarica* (in Europe).

—Translation of original description.

On bark, twigs and leaves lying on the ground. New York and Ohio. November.

I have not seen the type of *C. griseo-pallida* nor any European specimens which have been compared with it, but Peck, Rep. N. Y. State Mus. **30**: 48. 1879, has referred to this species a collection which he made at Sand Lake, New York. Peck notes that his specimens sometimes have a very short stem. I found the spores of these specimens hyaline, even, somewhat flattened on one side, 4 x 3 μ; basidia 12 x 4 μ.

Specimens examined:

New York: Sand Lake, *C. H. Peck* (in Coll. N. Y. State).

15. C. subgelatinosa Berk. & Rav. Grevillea **2**: 5. 1873.

Type: in Kew Herb.

Fructifications scattered, somewhat gelatinous, sessile, flattened, externally cinereous and farinaceous, the thin margin inflexed; hymenium slightly convex, even, brown; basidia clavate, about 25 x 5–6 μ, probably 2-spored; spores colorless, even, ellipsoidal, 8 x 3½ μ.

Fructifications about 1½ mm. broad.

On *Alnus serrulata*. South Carolina.

The fructifications of the type have dried with the slightly convex hymenium so prominently visible that they resemble brown apothecia of lichens with a pale margin (exciple). The most of the basidia are immature; I found one showing two sterigmata distinctly. No spores were found attached to basidia; the spore characters, which are given above, are those of loose spores in the preparation. *C. subgelatinosa* is so very distinct from our other species of *Cyphella* that it will probably be overlooked by botanists collecting *Basidiomycetes* only, unless especially kept in mind.

Specimens examined:

South Carolina: Aiken, *Ravenel, 1714*, type (in Kew Herb.).

16. C. Ravenelii Berk. Grevillea **2**: 5. 1873. Plate 19. fig. 14.

Type: type and cotype in Kew Herb. and in Curtis Herb. respectively.

Fructifications single or gregarious, sessile, subglobose, somewhat flattened, depressed at the pore, minutely hairy under a lens, vinaceous buff; hairs minutely rough, about 300 μ long, 4 μ thick, tapering towards the free end, olive-yellow under the microscope; spores hyaline, or perhaps very slightly colored, even, broadly ellipsoidal, 10–12 x 6–8 μ.

Fructifications 0.6 mm. high, 0.8 mm. broad; pore 0.15 mm. in diameter.

On bark of *Carya*. South Carolina.

The specimens of this species which I have seen have been on thick and cracked portions of bark apparently from large branches or the main trunk of the tree. Sometimes only one fructification occurs on a piece of bark a centimeter square; sometimes such a piece bears from 3 to 6 fructifications with some of them barely in contact with one another. The type specimen contains so few fructifications that I made a microscopic preparation at Kew Herbarium from the specimen distributed by Ravenel in Ellis, N. Am. Fungi, 721, which seems to me to be certainly the same species as the type. Berkeley described the spores in his original description as "elliptic, .00025 (in.) long"; I found them about twice this length in my preparation referred to and also in a preparation recently made from the specimen in Ravenel, Fung. Am., 130, in the Mo. Bot. Gard. Herb.

Specimens examined:

Exsiccati: Ravenel, Fung. Am., 130; Ellis, N. Am. Fungi, 721.

South Carolina: Aiken, *Ravenel, 1755*, the type and cotype (in Kew Herb. and in Curtis Herb. respectively); and also Aiken, *Ravenel*, Ravenel, Fung. Am., 130, and Ellis, N. Am. Fungi, 721.

17. C. texensis Berk. & Curtis, Grevillea **20**: 9. 1891. Plate 19. fig. 10.

Type: in Kew Herb.

Fructifications scattered, sessile, pallid but at present time

Isabella-color (melleus of 'Chromotaxia'), cup-shaped, at length flattened and disk-shaped, externally hairy; hairs olive-ocher under the microscope, granular incrusted, cylindric, 300–400 x 4½–6 μ; basidia clavate, 25–30 x 6–8 μ, 4-spored; spores hyaline, even, broadly ellipsoidal, 13 x 8 μ.

Fructifications 1–1½ mm. broad.

On *Quercus*. Texas.

The type is scanty, consisting of three fructifications, but these fructifications are in fine condition and present well the characters of the species. *C. texensis* now impresses me as more closely related to *C. Ravenelii* than I observed when studying the specimens of both in Kew Herbarium. The fructifications of *C. texensis* are the melleus of Saccardo's 'Chromotaxia' and the hairs are of a little greater diameter and have larger incrusting granules than those of *C. Ravenelii*, but the spores and basidia are very similar in form and dimensions in both species.

Specimens examined:

Texas: *Wright, 3779*, type (in Kew Herb.).

18. C. mellea Burt, n. sp. Plate 19. fig. 12.

Type: in Burt Herb. and in U. S. Dept. Ag. Herb.

Fructifications closely gregarious, sessile, Isabella-color, spherical and with margin inrolled in the dried state, sometimes obconic, externally hairy; hairs granular incrusted, baryta-yellow under the microscope, cylindric, 80–100 x 3½–4 μ; hymenium even, whitish or pale olive-buff; basidia clavate, 12–16 x 6 μ; spores mostly colorless but some pale baryta-yellow, even, broadly ellipsoidal, 5–6 x 4–4½ μ.

Fructifications about ⅕–½ mm. high and broad.

On rotten wood of *Salix nigra*. Louisiana. December.

In the specimen upon which the description is based, the most of the fructifications are about ⅕ mm. high and broad and are distributed on the rotten wood at the rate of about 200 per square centimeter. Rarely a short stem-like base is visible when the fructifications emerge from the bottom of small crevices between the fibers of the wood, but the fructifications are generally sessile. The species is intermediate between *Cyphella* and *Solenia* but is included in the former genus because the fructifications do not arise from a common subiculum and are more globose than in *Solenia*. The description of *C. mellea* suggests

those of *C. Ravenelii* and *C. texensis* in many respects, but the fructifications are much smaller and more numerous than in either of these species, and their various parts are also much smaller and some of the spores are colored.

Specimens examined:

Louisiana: Bohemia, Plaquemines Co., *A. B. Langlois, 864a*, type, in Burt Herb. and also (in U. S. Dept. Ag. Herb.); *A. B. Langlois, 864* (in U. S. Dept. Ag. Herb.).

19. **C. fasciculata** Schw. ex Berk. & Curtis, Jour. Acad. Nat. Sci. Phila. **3**: 207. 1856. Plate 19. fig. 17.

Cantharellus fasciculatus Schw. Trans. Am. Phil. Soc. N. S. **4**: 153. 1831.—*C. fasciculatus* Schw. in Saccardo, Syll. Fung. **5**: 495. 1887.—*Cyphella fasciculata* Berk. & Curtis, Grevillea **2**: 6. 1873.—*Solenia anomala* Pers. var. *orbicularis* Peck, Rep. N.Y. State Mus. **47**: 168 (42). 1894.—*Cyphella fulva* Berk. & Rav. Grevillea **2**: 5. 1873.—*C. Ravenelii* Saccardo, Syll. Fung. **6**: 672. 1888.—*C. Saccardoi* Sydow, in Saccardo, Syll. Fung. **14**: 233. 1900.—*C. furcata* Berk. & Curtis, Grevillea **2**: 5. 1873.

Type: in Herb. Schweinitz.

Fructifications gregarious, sometimes fascicled, pezizoid, tawny olive; pileus stipitate, cup-shaped, extended vertically or pendulous, tomentose with tawny-olive, even-walled hairs which are flexuous or somewhat spirally curved towards the tips, the margin strongly inrolled; stem short, variable in length, cylindric, tomentose, colored like the pileus; hymenium concave, even, drying olive-buff; spores hyaline, even, cylindric, slightly curved, 7–9 x 2–2½ μ, borne four to a basidium.

Fasciculate clusters about 2 mm. in diameter, 1 mm. high; fructifications ⅓–1 mm. in diameter, 1–2 mm. high; stem ½–1 mm. long, ⅕–½ mm. thick.

On bark of twigs of *Alnus* in swamps and rarely on *Prunus virginiana* and *Pyrus Malus*. Canada and Newfoundland to South Carolina and westward to Wisconsin. Throughout the year, more highly fasciculate from autumn to spring. Common.

This fungus is very common on dead twigs of *Alnus* in swamps. The color is similar to that of *Solenia anomala* but the fructifications are rather larger and more cup-shaped than those of the latter and have the hymenium merely concave rather than lining a tube. The fructifications burst out through the outer bark

either singly or in clusters of from two to twenty individuals more or less connected together at the base. The differences in habit between the extremes of highly fascicled forms and those with fructifications gregarious and largely single, impress one as of specific weight at first and I should like to recognize these extremes as two species but they intergrade too completely. The dated collections which I have seen, indicate that the specimens become highly fasciculate in autumn and winter.

I do not understand why Berkeley attempted authorship for this species. The *C. fasciculata* B. & C. is certainly that of Schweinitz both in description and in fascicled form of types; and as for *C. fulva* B. & Rav., it is noted in the original description that it is the same as *Cantharellus fasciculatus* Schw.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 936, fascicled form; Ell. & Ev., Fung. Col., 1818, fascicled form under the name *C. Ravenelii* Berk.; Shear, N. Y. Fungi, 308, fascicled form under the name *Solenia anomala* (Pers.) Fr. var. *orbicularis*. Pk. Peck det.; Ravenel, Fung. Car. IV., 16, the type distribution of *C. fulva* B. & Rav.; Ravenel, Fung. Am., 129 (bearing spores in abundance); Shear, N. Y. Fungi, 56.

Newfoundland: Headquarters, *B. L. Robinson & H. von Schrenk* (in Mo. Bot. Gard. Herb., 4764 and 43789, the latter communicated by W. G. Farlow); Bay of Islands, *A. C. Waghorne, 127* (in Mo. Bot. Gard. Herb., 42593).

Quebec: Hull, *J. Macoun, 355.*

Ontario: Ottawa, *J. Macoun, 23.*

Maine: *J. Blake* (in Curtis Herb., 6926, and in Kew Herb.).

New Hampshire: Conway, *W. G. Farlow;* North Conway, *W. G. Farlow* (in Mo. Bot. Gard. Herb., 43786); Shelburne, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 4765), *W. G. Farlow* (in Mo. Bot. Gard. Herb., 43787); Franklin Falls, *Mrs. J. B. Harrison,* Ellis, N. Am. Fungi, 936.

Vermont: Middlebury, on *Alnus* and on *Prunus virginiana, E. A. Burt.*

Massachusetts: Newton, *W. G. Farlow* (in Mo. Bot. Gard. Herb., 42591, 42592 and 43788).

New York: *Torrey,* type (in Herb. Schw.); *Sartwell,* cotype and type of *C. fasciculata* B. & C. (in Curtis Herb., 2659, and in

Kew Herb. respectively) and specimen (in Mo. Bot. Gard. Herb., 4937); Ithaca, *G. F. Atkinson;* East Galway, *E. A. Burt;* Keeseville, *C. O. Smith,* Ell. & Ev., Fung. Col., 1818; Alcove, *C. L. Shear,* Shear, N. Y. Fungi, 56 and 308; Albany, *C. H. Peck,* comm. by H. D. House (in Mo. Bot. Gard. Herb., 43821); Karner, *C. H. Peck,* comm. by H. D. House (in Mo. Bot. Gard. Herb., 43820).

South Carolina: *Ravenel, 1683* (in Curtis Herb. and in Kew Herb.), and in Ravenel, Fung. Car. IV., 16; Aiken, *Ravenel,* Ravenel, Fung. Am., 129.

Alabama: *Beaumont,* the cotype and type of *C. furcata* (in Curtis Herb., 4022, and in Kew Herb. respectively).

Wisconsin: Madison, *W. Trelease* (in Mo. Bot. Gard. Herb., 42594).

20. C. conglobata Burt, n. sp. Plate 19. fig. 15.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructifications cespitose, 10–30 together, sessile on a common short trunk which is erumpent through the bark; individual fructifications subglobose, fuscous and glabrous when moist, drying mouse-gray and with the margin inrolled; hymenium concave, black or nearly black; basidia simple, with four sterigmata; spores colorless, even, cylindric, slightly curved, 8–10 x $2\frac{1}{2}$–3 μ.

Cluster 1–2 mm. in diameter, emerging about $\frac{1}{2}$ mm. from the bark; cups 400–500 μ broad, nearly as high.

Clusters scattered on small limbs of *Alnus.* New Hampshire and New York. July and September.

The clusters of this curious fungus are distributed at the rate of about 5 or 6 clusters to the square centimeter on what I conclude to have been the under side of a horizontal limb—perhaps a limb prostrate on the ground; for cups in clusters exactly on this presumably under side have the pore central while in the clusters which emerged more obliquely from the limb the cups are somewhat auriform with oblique pore and are arranged in imbricated manner. The outer surface of the cups is composed of irregularly branched and interwoven pale brownish hyphæ about 2 μ in diameter. The substance of the fructifications and common trunk-like base is composed of colorless hyphæ with walls gelatinously modified.

One might regard this fungus as the type species of a new genus distinct from *Cyphella* or *Solenia* by the common central mass on which the individual cups are borne, but in *Cyphella fasciculata* the cups sometimes occur singly and sometimes branching from a common central or basal mass. For this reason it seems best to include the present species in *Cyphella* through its relationship in plan of structure to *C. fasciculata*, from which it is specifically distinct in other respects, however. Both these species are excluded from *Solenia* by their short and globose fructifications and by the absence of a subiculum on the general area over which the clustered fructifications are distributed.

Specimens examined:

New Hampshire: Lower Bartlett, *R. Thaxter*, comm. by W. G. Farlow, 4, type (in Mo. Bot. Gard. Herb., 43806, and in Farlow Herb.).

New York: Adirondack Mts., *C. H. Peck*, comm. by H. D. House (in Coll. N. Y. State and in Mo. Bot. Gard. Herb., 43818); North Elba, *C. H. Peck*, comm. by H. D. House (in Mo. Bot. Gard. Herb., 43819).

21. C. fumosa Cooke, Grevillea **20**: 9. 1891. Plate 19. fig. 11.

Type: in Kew Herb.

Fructifications gregarious, membranaceous, cup-shaped, flexuous, sepia or olive-brown and blackening, even, attenuated below into a very short stipe, or sessile; hymenium even; basidia cylindric-clavate, 20 x 4–5 μ; spores colorless, even, somewhat flattened on one side, 6–8 x $3\frac{1}{2}$–4 μ.

Fructifications 1–2 mm. broad.

On rotting leaves of *Gladiolus*. South Carolina.

Cooke described the spores of this species as globose, 4 μ in diameter, but I found no such spores in my preparation from the type. Spores 6–8 x $3\frac{1}{2}$–4 μ are abundant and are probably the spores of this species, although I could not find any spores still attached to the basidia. I conclude from my microscopical preparations that the fructifications are glabrous.

Specimens examined:

South Carolina: Aiken, *Ravenel, 3071*, type (in Kew Herb.).

SPECIES IMPERFECTLY KNOWN

C. cinereo-fusca Schw. ex Saccardo, Michelia **2**: 303. 1881.

Peziza cinereo-fusca Schw. Schrift. d. Naturforsch. Gesell., Leipzig, **1**: 119. 1822; Fries, Syst. Myc. **2**: 97. 1823.—*Cyphella cinereo-fusca* (Schw.) Sacc. Syll. Fung. **5**: 674. 1888.—*Lachnella cinereo-fusca* (Schw.) Sacc. Syll. Fung. **8**: 399. 1889.

Fructifications minute, gregarious, sessile, externally farinaceous-hirsute and ash-green, the margin incurved; hymenium fuscous-bay.

On decorticated branches of *Cercis*. [North Carolina.]
3 mm. broad. Cups often closed.

—Translation of original description.

I have not seen an authentic specimen of this species nor anything on *Cercis* which seems referable to it. The species is given here on the authority of Saccardo, *l. c.*, who refers to this species a *Cyphella* collected on *Vitis vinifera* near Toulouse, France, by Roumeguere. Saccardo does not state that he made comparison with an authentic specimen from Schweinitz, and he has entered the species in the 'Sylloge Fungorum' in both the *Basidiomycetes* and the *Discomycetes*.

C. Palmarum Berk. & Curtis, (Fung. Cub.) Jour. Linn. Soc. Bot. **10**: 337. 1867.

Type: type and cotype probably in Kew Herb. and Curtis Herb. respectively.

White, pileus cyathiform, externally obscurely pruinose; stem short, tomentose, rather thick.

Scarcely 2 mm. high; stem rather thick for the size of the pileus, often oblique.

On petioles of palms. Cuba. June. *C. Wright, 753.*

—Arranged from original description.

C. Peckii Sacc. Syll. Fung. **6**: 684. 1888.

C. candida Peck, Rep. N. Y. State Mus. **27**: 99. 1875.

Type: in Coll. N. Y. State.

Fructifications scattered or gregarious, membranaceous, soft, obconic, nearly or quite sessile, sometimes deflexed, wholly white, externally tomentose; hairs tapering to a sharp point, rough-walled, 60–70 x $3\frac{1}{2}$ μ.

Fructifications about 1 mm. broad.

On dead stems of ferns, *Osmunda cinnamomea*. New York. September.

The type specimens of this species are immature. I could make out neither distinct asci nor basidia in the hymenium. In a crushed preparation I found one spore, colorless, even, pointed at one end, 6 x 2½ μ. It may have been a basidiospore of this species or it may have been a foreign spore.

Specimens examined:

New York: Forestburgh, *C. H. Peck*, type (in Coll. N. Y. State).

C. perexigua Sacc. Michelia **2**: 136. 1880.

Cups bell-shaped, very short and obliquely stipitate, small, ½–¾ mm. long, thin-membranaceous, internally and externally whitish cinereous, externally minutely puberulent; spores not seen. Appears related to *C. erucæformis* and *cupuliformis* but is one-third as large. . . . On decorticated branches. South Carolina. *Ravenel.*—Translation of original description.

I have not seen the type of *C. perexigua*, which is probably in Saccardo Herb. As basidia and basidiospores have not been found for American specimens, it is uncertain whether this species is a *Cyphella*. Patouillard, Tab. Anal. Fung. 19. *f. 34.* 1883, referred to *C. perexigua* a species of *Cyphella* which he collected at Poligny, France, but that reference is doubtful in the absence of knowledge in regard to basidia and basidiospores for American specimens.

C. pezizoides Zopf, in Morgan, (Myc. Fl. Miami Val.) Jour. Cincinnati Soc. Nat. Hist. **10**: 202. 1888.

Type: probably in the State Univ. of Iowa Herb.

"Fructifications membranaceous, nearly sessile, globose then cup-shaped, clothed externally with long erect white hairs. Hymenium even, brownish; spores obovate, .012–.013 mm. in length.

"On old herbaceous stems; not common, cupule pezizoid, scarcely pedicillate, about half a line in diameter. The long hairs are erect and connivent over the hymenium; they are hyaline and incrusted with crystals of calcium oxalate."

—Original description.

The type is not accessible at present.

C. trachychæta Ell. & Ev. Jour. Myc. 4:73. 1888.

Type: in New York Bot. Gard. Herb.

Fructifications gregarious, sessile by a narrow base, white, cup-shaped, clothed outside with appressed hairs; hairs subhyaline, very rough, with a smooth tapering tip 12–15 μ long; hairs paler around the base of the fructification and coarsely roughened by irregularly shaped tubercles, some of which are prolonged into short spines; hymenium nearly white with a slight tinge of slate color; basidia and spores could not be well made out, but the latter are apparently very minute.

Fructifications 300–400μ high and broad, occasionally 1 mm. broad and with the margin distinctly lobed.

On fallen leaves of *Quercus*. Louisiana. July.

The above description is arranged from that originally published. I am under obligation to Dr. Murrill for recently sending to me a portion of the type for study, but the specimen proves too immature to show whether this species is a basidiomycete. The hymenium of this specimen is now pale olivebuff; the hairs are 50–75 x 6 μ, heavily encrusted except near the tips, but I failed to find any hairs roughened by tubercles or bearing spines.

Specimens examined:

Louisiana: *A. B. Langlois, 1424*, type (in N. Y. Bot. Gard. Herb.).

C. Bananæ Cooke, Grevillea **6**: 132. 1878.

Type: probably in Kew Herb.

Fructifications fuliginous or wood-brown, finger-shaped, pendulous-extended behind, glabrous, the margin entire; hymenium white, rugose; spores linear, obtuse, curved, 10–12 x $2\frac{1}{2}$ μ. —Translation of original description.

On dead leaves of *Musa*. Gainesville, Florida. *Ravenel.*

C. filicicola Berk. & Curtis, Grevillea **2**: 5. 1873.

Type: type and cotype probably in Kew Herb. and Curtis Herb. respectively.

Stem very short; cups irregular, sometimes oblique, externally very obscurely tomentose, umber.

On dead fern. North Carolina. Curtis Herb., 4934, type.

The above contains all the items of the original description; I overlooked this species when studying in Curtis Herb. and in Kew Herb.

C. musæcola Berk. & Curtis, Jour. Linn. Soc. Bot. **10**: 337. 1867.

Type: type and cotype in Kew Herb. and Curtis Herb. respectively.

Pileus crucible-form, pallid purple, with very short stem or sessile, externally tomentose; hymenium luteus (cadmium-yellow). —Translation of original description.

About 2 mm. across.

On sheaths of plantain leaves. Cuba. *C. Wright, 751.*

By the kindness of Dr. Farlow I have been permitted to examine a specimen from the type collection. I fail to find any fructifications of a *Cyphella* present. A leaf-spot fungus has caused some dark purple discolorations 1–2 mm. in diameter at various points in the surface of the leaf.

Specimens examined:

Cuba: *C. Wright, 751*, comm. by W. G. Farlow (in Mo. Bot. Gard. Herb., 43790).

EXCLUDED SPECIES

C. convoluta Cooke, (Fungi of Texas) Ann. N. Y. Acad. Sci. **1**: 179. 1878.

Type: In Kew Herb.

"Scattered, cup-shaped, then flattened, 1 to 2 mm. wide, margin membranaceous, involute, externally white, internally fleshy-red; spores oblong (.007 mm. long).

"On trunks. Ravenel (295)."—The original description.

I examined the type of this fungus, which was collected at Houston, Texas, and do not regard it as a *Cyphella*. The "basidia" are filiform and only 1-spored; spores are abundant, hyaline, even, 4–5 x 2–2½ μ.

C. Cupressi Schw. ex Fries, Epicr. 567. 1836–1838.

Merulius Cupressi Schweinitz, Schrift d. Naturforsch. Gesell., Leipzig, **1**: 92. 1822.

This species is an insect gall, not a Basidiomycete. Its true nature seems to have been first pointed out by Berkeley & Curtis, Jour. Acad. Nat. Sci. Phila. **3**: 207. 1856.

C. subcyanea Ell. & Ev. Jour. Myc. **2**: 37. 1885.

As this species is not mentioned in Saccardo's 'Sylloge Fungorum' and as the early numbers of the Journal of Mycology are rare, I quote the original description as follows:

"On living leaves of Sabal Palmetto, Louisiana, Nov. 1885. Rev. A. B. Langlois, No. 57. Shallow cup-shaped, thin, substipitate, oblique, less than 1 mm. across, whitish and nearly smooth outside, hymenium bluish or lead colored. Spores filiform multinucleate, upper end thickened, curved into a semicircle, 40–60 μ long by $1\frac{1}{2}$ μ thick, on short (11–12 x $1\frac{1}{2}$–2 μ) subcylindrical sporophores, which are a little thickened below."

This species was distributed in 1891 in Ell. & Ev., N. Am. Fungi, 2602, the specimens having been collected on living stems of *Smilax* in Louisiana by Mr. Langlois. Mr. Langlois communicated to me still better specimens on dead canes of *Arundinaria*. The fructifications occur scattered here and there in grayish areas 2–4 mm. long by $\frac{1}{2}$–1 mm. broad on the surface of the stems. Dr. Farlow informs me in a letter as the proofs are at hand that the above species is the lichen *Heterothecium Augustinii* Tuckm.

(To be continued.)

Explanation of Plate

PLATE 19

The figures of this plate have been reproduced natural size from photographs of dried herbarium specimens except in the cases noted otherwise.

Fig. 1. *Craterellus borealis.* From the type specimen collected at Gready Island, Labrador, by Owen Bryant.

Fig. 2. *Cyphella galeata.* From photograph, natural size, of the figure in Flor. Dan. *pl. 2027. f. 1.*

Fig. 3. *C. muscigena.* The two figures on the left are from specimens collected at Floodwood, New York, by E. A. Burt; the two on the right are from the type collection of *Craterellus Pogonati* collected at South Windsor, Connecticut, by C. C. Hanmer, 1956.

Fig. 4. *C. capula.* From photograph, natural size, of the figure in Fung. Dan. **2**: *pl. 22.*

Fig. 5. *C. minutissima.* From the type specimens collected at Chocorua, New Hampshire, by W. G. Farlow, 3. Drawings of, *a*, two fructifications, x14; *b*, spores, x510; *c*, a hair from outer wall of fructification, x510.

Fig. 6. *C. Langloisii.* From the type specimens collected at St. Martinville, Louisiana, by A. B. Langlois, cz. Drawings of, *a*, two fructifications, x17; *b*, spores, x510; *c*, a hair from outer wall of fructification, x510.

Fig. 7. *C. porrigens.* From the type specimens collected at Cinchona, Jamaica, by W. A. and Edna L. Murrill, 607. Drawings greatly enlarged of, *a*, a fructification showing attachment to a piece of woody stem; *b*, diagrammatic section of the same fructification; *c*, two spores, x510.

Fig. 8. *C. caricina.* Three spores, x510, from the type specimen collected at Verona, New York, by C. H. Peck.

Fig. 9. *C. cupulæformis.* From the specimens in Ravenel, Fung. Am., 224, collected at Darien, Georgia, by Ravenel. Drawings of, *a*, two fructifications, x6; *b*, a basidium, x510; *c*, four spores, x510.

Fig. 10. *C. texensis.* Three spores, x510, from the type specimens collected in Texas, by C. Wright, 3779.

Fig. 11. *C. fumosa.* Three spores, x510, from the type specimens collected at Aiken, South Carolina, by Ravenel, 3071.

Fig. 12. *C. mellea.* From the type specimens collected at Bohemia, Louisiana, by A. B. Langlois, 864a. Photograph, *a*, of a piece of wood bearing many fructifications, and drawings of, *b*, median longitudinal section of a fructification, x60; *c*, three spores, x510; *d*, a hair from outer wall of fructification, x510.

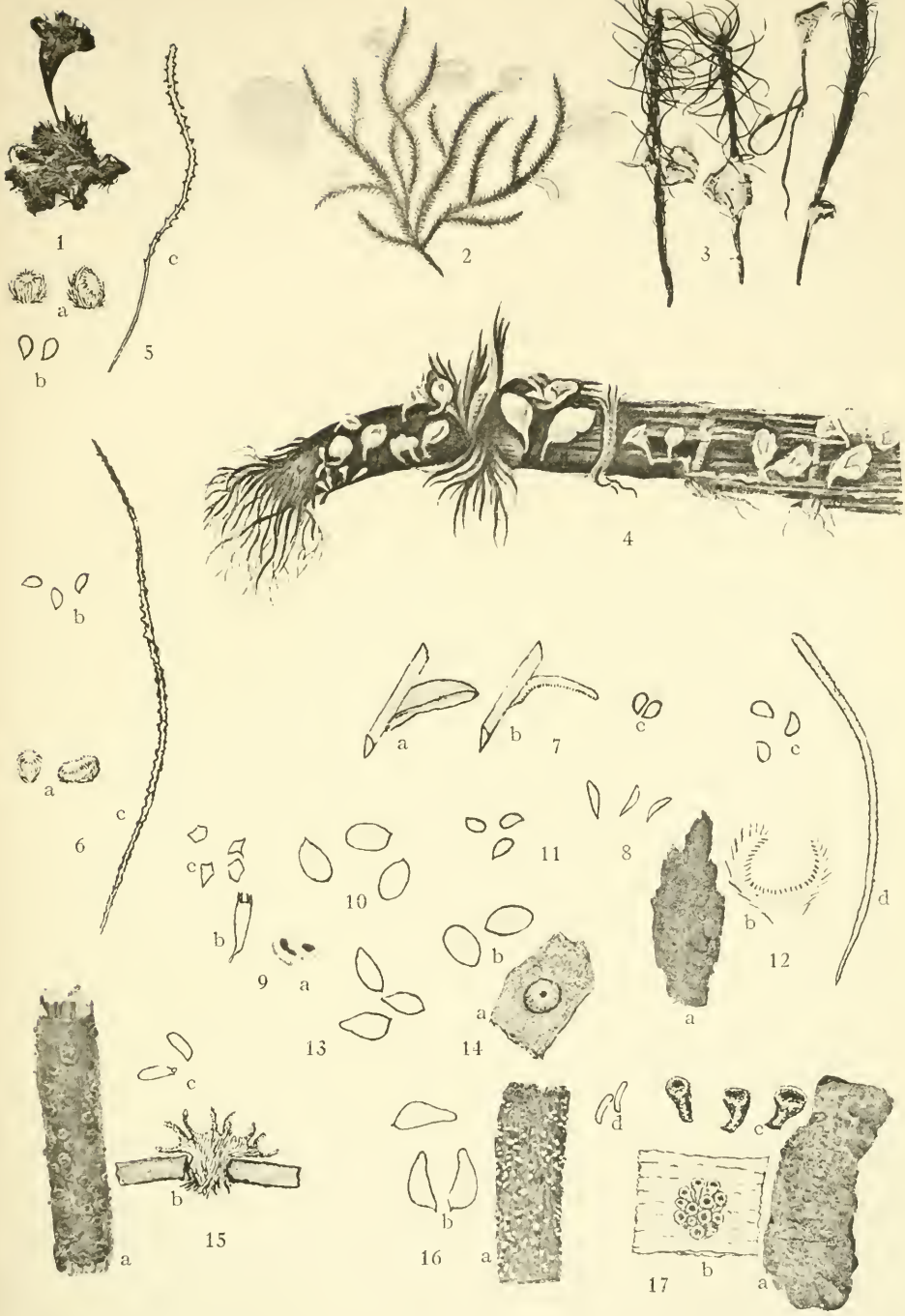
Fig. 13. *C. villosa.* Three spores, x510, from the specimens in Krieger, Fung. Sax., 1457, collected at Königstein, Germany, by W. Krieger.

Fig. 14. *C. Ravenelii.* From the specimens in Ravenel, Fung. Am., 130, collected at Aiken, South Carolina, by Ravenel. Drawings of, *a*, a fructification on a piece of bark, x6; *b*, two spores, x510.

Fig. 15. *C. conglobata.* From the type specimens collected at Lower Bartlett, New Hampshire, by R. Thaxter. Photograph, *a*, of a portion of a branch bearing many clusters of fructifications, and drawings of, *b*, a median vertical section through one cluster of fructifications, x6; *c*, two spores, x510.

Fig. 16. *C. Tiliæ.* From specimens collected at Middlebury, Vermont, by E. A. Burt. Photograph of, *a*, a piece of limb bearing many fructifications, and drawing of, *b*, three spores, x510.

Fig. 17. *C. fasciculata.* From specimens collected at Ottawa, Canada, by J. Macoun, 23. Photograph of, *a*, a piece of bark bearing many fructifications, and drawings of, *b*, a cluster of fructifications, x6; *c*, three fructifications, x10; *d*, two spores, x510.



BURT—THELEPHORACEAE OF NORTH AMERICA

1. CRATERELLUS BOREALIS.—2. CYPHELLA GALEATA.—3. C. MUSCIGENA.—4. C. CAPULA.—5. C. MINUTISSIMA.—6. C. LANGLOISII.—7. C. PORRIGENS.—8. C. CARICINA.—9. C. CUPULAEFORMIS.—

The Thelephoraceae of North America. IV

Exobasidium

EDWARD ANGUS BURT

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THE THELEPHORACEAE OF NORTH AMERICA. IV[1]

EXOBASIDIUM

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EXOBASIDIUM

Exobasidium Woronin, Naturforsch. Ges. Freiburg Verhandl. **4**: 397–416. *pl. 1–3.* 1867.—Saccardo, Syll. Fung. **6**: 664. 1888.—Hennings, in Engl. & Prantl, Nat. Pflanzenfam. (**I.1****) : 103. 1897.

The type species of the genus is *Exobasidium Vaccinii* Fuck. ex Wor.

Fungi parasitic in leaves, shoots, and flowers, which they deform more or less, producing on the surface of these organs an effused hymenium, rarely composed of basidia alone and more usually felt-like and composed chiefly of interwoven hyphae bearing basidia and conidiophores; basidia simple; spores white, simple or septate.

Exobasidium resembles so closely in the thinness of its fructifications such species of *Corticium* and *Peniophora* as *Corticium byssinum, Peniophora asperipilata, P. pilosa,* and *P. subalutacea* that I follow Saccardo and include it with the above genera in the *Thelephoraceae.* Hennings in Engler & Prantl's 'Die Natürlichen Pflanzenfamilien,' has raised *Exobasidium* to ordinal rank but this is not justified by the structure of the many fructifications of *Exobasidium* which I have sectioned; the illustrations in text-books of the structure in section of the fructification are decidedly diagrammatic and simplified.

In his work already cited, Woronin gives a detailed account of the morphology and life history of *Exobasidium Vaccinii* and illustrates this account with three double plates. The interest in this fungus which Woronin's work aroused has

[1] Issued October 8, 1915.

NOTE.—Explanation in regard to the citation of specimens studied is given in Part I, Ann. Mo. Bot. Gard. 1: 202, footnote.

resulted in the publication of other species by various authors, whose descriptions contrast sharply with that of Woronin in giving little weight to the morphological characters of the fungus under consideration, but extended description of the form and color of the gall of a particular collection, with passing reference to the occurrence of the fungus upon a hitherto unpublished host. In case of the galls, the descriptions usually fail to state what other forms besides the one mentioned the galls may have on other organs of the new host and likewise omit mention of the different forms they may have at other times in the year than the particular time at which the type collection was made. Woronin's description of *E. Vaccinii* was based upon field observations extended through two seasons, during which more than a thousand specimens were collected. He gives one double page colored plate to show the various types of galls produced by the different organs of *Vaccinium vitis-idaea.*

Plate 21 is a photographic reproduction, reduced one-fifth, of Woronin's colored plate; it shows the forms of galls as determined by the particular organ of the host, *Vaccinium vitis-idaea,* which makes hypertrophic response to local stimulation by the parasitic fungus. A local change of color from green to some shade of red is common in plant portions infested with *Exobasidium.* In the photographic reproduction of Woronin's plate the reddened areas of the original appear light colored. In fig. 1, the left side of the uppermost leaf was attacked by the fungus, producing what I term a leaf spot gall. The affected region of the leaf is reddened on the upper side and bears the fructification which may be felty or scurfy on the under side; this leaf is not distorted much in form and thickness.

Figures 2–9 present leaf galls, reddened on the upper side of the leaf and distorted and thickened by hypertrophic growth so as to become more or less concave with respect to the upper surface. I designate this form of gall as leaf concavity.

Figures 10–17 illustrate shoot galls, in the production of which, stems of the current season's growth have been greatly

enlarged and have turned pale and slightly pink under the stimulus of the infecting fungus. In figs. 10–15 the lateral axillary buds along the infected stem have abnormally enlarged by the stimulation of the fungus and have developed in several instances short, delicate, wax-like or coralloid branchlets of carmine color. Such branchlet shoot galls are beautiful objects in their vegetative condition; they constitute a noteworthy type of gall which is quite different in appearance from the more common leaf galls, produced in response to local infection of leaves. Nevertheless, the common cause of these different gall forms is well brought out by Woronin's illustrations, especially by figs. 11, 12, 13, and 15. Upon shoot galls similar to the above, there have been published *Exobasidium Andromedae* Karst. non Peck for the shoot galls of *Andromeda polifolia, E. cassiopes Peck* for the shoot gall of *Cassiope Mertensiana,* and *E. Oxycocci* Rostrup for that of *Oxycoccus palustris.*

Figures 16–18 show the flower type of gall of *Vaccinium vitis-idaea,* that is, the abnormal growth form made by individual flowers in response to the stimulation of their tissues by the fungus. That both the flower gall and the leaf gall have a common cause has been brought out well by the selection of the specimens used for figs. 16 and 17. In fig. 18 there is presented local infection of a single flower. This is important because isolated flower galls upon a new host have in some cases been regarded as *prima facie* evidence that they have been caused by a new species of *Exobasidium.*

Other host plants produce some types of galls, when infected with *Exobasidium,* which were not figured by Woronin for *Vaccinium vitis-idaea* but which are more or less common. Such gall types are:

(a) Leaf type in which scattered whole leaves of the host are infected. These leaves redden more or less on the upper side and bear on the whole under side the scurfy or felty fructification but are not notably thickened or deformed. This gall differs from the leaf spot gall of Woronin's fig. 1 merely in having the whole of the leaf infected.

(b) Shoot gall with all the leaves toward the tip of the

shoot infected but not deformed. These leaves may be almost normally green on the upper side or they may be more or less reddened, sometimes to carmine red; on the under side they become clothed with the felty fructification of the fungus but the leaves are not deformed. This is merely a more general infection than the leaf type *a,* described above, and is often associated with it on the same plant as well as with the leaf spot and leaf concavity forms.

(c) Bag gall of *Andromeda ligustrina.* This is the extreme in gall production. This gall finally becomes a hollow bag which attains a maximum size of 10–15 cm. in length by 5–10 cm. in diameter. These bag galls are either terminal or lateral on leafy shoots of the current season's growth. When lateral, such a gall has the morphological position of a leaf.

(d) Bud gall of *Symplocos tinctoria.* The expanding leaf buds are deformed into a subglobose mass which may be 3–3½ cm. in diameter. In this gall, the undeveloped stem of the bud is greatly enlarged and the individual leaves of the bud are greatly thickened and deformed.

In North America, we have a large number of species of *Ericaceae* which produce galls when infected by *Exobasidium.* The specimens which have accumulated under *Exobasidium* in herbaria show that none of the gall forms which I have designated under distinctive names in the preceding paragraph are isolated forms. Favorable hosts show a connection and gradation between the various gall forms as intimate as that presented by Woronin for *Vaccinium vitis-idaea.* However, the terms which I employ are useful for contrasting and comparing the data presented by the specimens which I have studied. These data are later given in tabular form.

The microscopic examination of an Exobasidium gall shows that it is composed principally of the tissues of the host plant. Hyphae of the fungus ramify about between the cells of the host and, in the galls in which deformation has taken place, the presence of the fungous hyphae has caused the host both to multiply and enlarge its cells in the infected region. The gall is, therefore, a direct product of the host plant, which

is stimulated to growth by the presence of the parasitic vegetative hyphae, by absorption of organic products from the host, and, undoubtedly, by excreta from the hyphae. We may see from Woronin's figures that the various organs of a given host produce different galls when infected by the same fungus; from which we may conclude that the several organs of the host make different growth responses to the same stimulating cause. We have in the host itself, in its several organs, and also in the age of tissues of these organs, as I shall point out later, factors not only able to produce, but actually producing, diversity in gall form even though but a single species of *Exobasidium* is the parasitic stimulant. Of what value, then, is the form of the gall as a taxonomic character for species of *Exobasidium?*

The different organs of the host differ in the resistance which they offer to infection by *Exobasidium.* Woronin notes in his work cited that out of more than a thousand specimens of *Exobasidium Vaccinii,* only twelve showed flower galls. Hence the flowers of *Vaccinium vitis-idaea* are much less subject to infection than the leaves. In only the one case, which he illustrates by fig. 18, did he observe local infection of a flower. In figs. 16 and 17, the infected flowers are borne on infected shoots and may have become infected through these shoots. We may therefore conclude that in a given host a high resistance of certain organs to infection by *Exobasidium* restricts the galls for that host to fewer organs and to a smaller number of forms than in some other host with a lesser resistance.

That the age of the organs, or their cells, of a host is an important factor in the determination of gall form is apparent if one observes throughout a season the succession of galls produced by a favorable host. In this connection Richards[1] has stated, "and also on Gaylussacia resinosa in the earliest formed distortions, whole shoots are transformed. Later in the season the Exobasidium forms only slight local distortions on the leaves, and still later one finds forms which do not distort the tissues of the host plant at all, but simply form a

[1]Bot. Gaz. 21 : 107. 1896.

scurf on the lower side of the leaves. The same succession is found in the forms on Andromeda down to the last mentioned." Richards determined by culture experiments that the remarkable bag galls of *Andromeda ligustrina* are merely early (June in Massachusetts) productions under the same specific fungous stimulus which later in the season induces leaf concavities on this host. The account of his experiments[1] may be summarized as follows: During July, Exobasidium spores were removed with suitable precautions from fresh mature bag galls of *Andromeda ligustrina* and were immediately transferred to buds and young leaves of experimental plants of the same species, which were isolated in a moist chamber. In about ten days faint discolorations of the leaves were noticed, at first yellowish and then pink. About five days later, the spots which had considerably enlarged, began to show unmistakable signs of thickening, forming the peculiar concavities in the leaves seen in other Exobasidia. In external form, and also in the matter of basidia and spores, this distortion resembled precisely the leaf form on *Andromeda ligustrina,* and indicates that the *Exobasidium* which produces the bag galls of the young buds is identical with the fungus which produces the leaf form found later in the season.

The foregoing presentation of the Exobasidium gall as a growth response of the host under stimulation by the fungus shows that very different forms of galls and differences in regard to abundance of each form on a host may result—

(a) From the different organs making the response.

(b) From differences in resistance of the several organs, which, in many cases, may undoubtedly be so great as to give complete immunity for certain organs.

(c) From the age of the organ attacked.

Since the host produces a great variety of gall forms as growth responses to attack by a single species of *Exobasidium,* how are we to decide whether a given gall form is ever sufficiently distinct to entitle its causative organism to separate specific rank? Gall forms are host products to so large an

[1] *loc. cit.,* p. 105.

extent that they can have little, if any, value for discriminating between species of *Exobasidium*. Into the formation of such galls so many other factors besides the Exobasidium hyphae enter that it is impossible to consider galls as homologous with the fructification of an ascomycete or that of a toadstool, and they should not be used therefore in the way these true fungous fructifications are used for affording in their form specific characters. As a matter of fact, the layer of basidia and conidia-bearing hyphae at the outside of the gall comprise the whole fructification of the parasitic fungus; this layer alone is morphologous with a toadstool. The mere form of the foreign substratum covered by the resupinate fructification of *Exobasidium* should have no greater taxonomic weight than it has in the closely related genus *Corticium*.

We should now consider the distribution of *Exobasidium Vaccinii* as a parasite upon various genera and species of the *Ericaceae*. Woronin limited his investigation of *E. Vaccinii* to what he observed on *Vaccinium vitis-idaea* and left the matter there for other investigators to go on with, if they were so disposed. As the collections which are made on this host nearly always show the fungus occurring in leaf spot galls and leaf concavity galls, and since these forms of galls are the only ones on this host common enough for distribution in published exsiccati, the species *Exobasidium Vaccinii* seems to have become altogether too closely associated with, and limited in mycological practice to, merely the very commonest gall forms which are produced under stimulation by *E. Vaccinii*. For example, Shear[1] states, "The typical form of *Exobasidium Vaccinii* occurs on *Vaccinium vitis-idaea*, producing hypertrophied spots on the leaves. No record has been found of the occurrence of hypertrophied shoots on this host similar to those found on cranberry plants. Rostrup[51] seems to have been the first to describe this form. In 1883 he reported it as occurring on *Oxycoccus palustris* in Denmark."

[1] Cranberry Diseases. U. S. Dept. Agr., Bur. Pl. Ind., Bul. 110: 36. 1907.

Without doubt, this misapprehension of the galls produced by *Vaccinium vitis-idaea* is due to the scarcity of copies of Woronin's original account of *Exobasidium Vaccinii,* for Woronin is at great pains to show that to *E. Vaccinii* are due both shoot galls and flower galls.

That the erroneous tendency of limiting to *E. Vaccinii* the production of only the commonest leaf galls is potent, is apparent from inspection of the table towards the close of this paper where under the heading, "Exobasidium Vaccinii (Fuck.) Wor. The following have been referred here invariably" there are grouped all Exobasidium galls produced by *Vaccinium vitis-idaea, V. vacillans, V. arboreum, V. pennsylvanicum, V. stamineum, Gaylussacia frondosa, G. resinosa, Arctostaphylos uva-ursi, A. nevadensis, Arbutus Menziesii, Rhododendron canadense, R. maximum,* and *Lyonia jamaicensis.*

Our *Gaylussacia frondosa* and *G. resinosa* of this list merit some detailed consideration for they compare very favorably with *Vaccinium vitis-idaea* as hosts for *Exobasidium Vaccinii.* The galls of these two species of *Gaylussacia* include during the season two shoot forms, leaf concavity type, leaf spot type, and the flower type. The flower type of gall is probably very rare; I have seen a dried herbarium specimen of it collected by Dr. Farlow, at Brewster, Massachusetts, and two others, preserved in alcohol in Seymour Herbarium, one of which was collected by A. B. Seymour, at Woods Hole, Massachusetts, and the other by Mrs. Pier, at Biddeford, Maine. These flower galls have a diameter of 10–12 mm.; all the floral organs are enlarged as in case of the flower galls illustrated by Woronin. Bartholomew collected and distributed in his 'Fungi Columbiani,' 3429, the shoot gall of the wax-like or coralloid type such as is produced by *Vaccinium vitis-idaea. Gaylussacia resinosa* very frequently produces as its earliest galls the other form of shoot gall with all the leaves felty on the whole under surface, more or less reddened above, and not deformed. Such a shoot gall is produced by *Vaccinium Myrtillus* in Europe; it has usually been regarded by European mycologists as due to *Exobasidium Vaccinii.* Its regular

occurrence in North America in a series of *E. Vaccinii* forms confirms the correctness of the reference.

As we take up the consideration of North American species of *Exobasidium* which have been published since 1867, we find that in nearly all cases peculiarities of galls have furnished the distinctive portion of the description. These odd or striking forms of galls have been discovered upon new hosts, as was to be expected, for a new host species would without doubt have composition and properties at least slightly different from those of *Vaccinium vitis-idaea*—so different that the growth response, i. e., the gall of this new host, might differ somewhat, perhaps differ notably, from that of *V. vitis-idaea,* even though the stimulus should be given by the same fungus. Two of the specific names to be considered are based entirely upon the occurrence of *Exobasidium* on a new host, and the other eight are founded upon more or less noteworthy galls. Reference to the second division of my table shows that gall form rather than host has caused the publication of specific names in *Exobasidium.*

Exobasidium Peckii, for example, was published as the cause of flower galls produced by *Andromeda Mariana.* Its flower galls are produced so frequently that they attracted attention; leaf concavity galls are common here also. The morphological characters of the fungous cause of these galls agree closely with those of *Exobasidium Vaccinii,* and the galls themselves are of types that *Vaccinium vitis-idaea* produces under stimulation by *Exobasidium Vaccinii.* No evidence of any nature has been offered tending to show that *E. Peckii* is not *E. Vaccinii* in all respects. The frequent production of flower galls by *Andromeda Mariana* can be simply accounted for as due to the susceptibility of the young flower to infection by the fungus, that is, to a special property of this host. I regard *Exobasidium Peckii* as a synonym of *E. Vaccinii.*

In connection with the discussion of *E. Peckii,* attention should be called to occasional flower galls produced by *Lyonia* (*Andromeda*) *ferruginea.* I have seen only four specimens of these galls, two from Georgia and two from Florida. All

resemble monstrous flowers—up to 5 cm. long in the dried state—with all floral organs enlarged proportionally, as in the flower galls of *Andromeda Mariana, Gaylussacia resinosa,* and *Vaccinium vitis-idaea.* Only flower galls are as yet known to me for *Lyonia ferruginea,* but as the morphological characters of the fungus found on the galls are those of *Exobasidium Vaccinii,* I regard these galls as similar to those of *Andromeda Mariana* but much larger and due to *Exobasidium Vaccinii.* The large size of these Lyonia galls is the expression of the growth response of the flower tissue of this host. It will be interesting if further collections of this host show that only the flowers are susceptible to infection by *Exobasidium.*

Exobasidium Oxycocci was proposed as a name for the fungus causing the shoot galls of wax-like or coralloid habit which are produced by *Oxycoccus palustris.* Similar galls are produced in the United States by *Vaccinium macrocarpon* and *V. intermedium.* Shoot galls of *V. macrocarpon* are illustrated in color by Shear[1] and also the leaf spot and leaf concavity galls which this host produces. The morphological characters of the fungus producing the shoot galls on the cranberry species of *Vaccinium* are the same as those of *Exobasidium Vaccinii;* the galls produced by cranberry plants are such as *E. Vaccinii* produces. As there is no evidence of any kind that *E. Vaccinii,* common throughout the same region, does not cause the cranberry galls, the name *E. Oxycocci* seems quite unnecessary.

Exobasidium Cassiopes and *E. Karstenii* have been published as causes of the shoot galls produced by *Cassiope Mertensiana* and *Andromeda polifolia* respectively. These shoot galls are of the wax-like or coralloid type such as *Vaccinium vitis-idaea* produces under stimulation by *Exobasidium Vaccinii.* As the morphological characters of the so-called *E. Cassiopes* and *E. Karstenii* are those of *E. Vaccinii,* and as no evidence has ever been presented that *E. Vaccinii* does not cause the galls referred to, *E. Cassiopes* and *E. Karstenii* should also be regarded as synonyms of *E. Vaccinii.*

[1] *loc. cit., pl. 8.*

Exobasidium Andromedae Peck is based on the bag gall produced by *Andromeda ligustrina.* This gall described in detail on a preceding page, is so very large and remarkable in structure that it did seem that here, if anywhere, must be the anomaly for higher fungi of a fungous cause, specifically different from *Exobasidium Vaccinii,* yet having the same morphological characters. From this point of view, Richards' experiment,[1] already described, of growing on the leaves of *Andromeda ligustrina* a July crop of leaf concavity galls from spores produced by a bag gall which had matured at the beginning of July, was very illuminating. It showed that such a bag gall is noteworthy only because it shows peculiar properties inherent early in the season in shoots and leaves of *Andromeda ligustrina,* that this bag gall belongs in the series with, and is caused by, the same fungus as the leaf concavity galls such as *Exobasidium Vaccinii* produces.

Richards made other experiments tending to show that *E. Vaccinii* produces the bag galls on *Andromeda ligustrina.* He demonstrated that the latter species is not immune to undoubted *Exobasidium Vaccinii,* that it is as susceptible to such spores as to those produced by its own bag galls. In July, spores of *E. Vaccinii* gathered from leaf concavity galls of *Gaylussacia resinosa* were transferred to buds and young leaves of *Andromeda ligustrina.* After about the same lapse of time as when spores from the bag galls were used, there appeared on the Andromeda leaves infected with *Exobasidium Vaccinii* distortions very similar to those produced by spores from the bag galls. As the large bag gall was the only occasion for the name *E. Andromedae* Peck, I agree with Richards that this name is a synomym of *E. Vaccinii.*

In confirmation from the herbarium side of the correctness of the above conclusion, I have a specimen collected in Idaho by Professor Piper, 772, on *Menziesia glabella,* which has a small terminal bag gall such as is produced by *Andromeda ligustrina,* and also a leaf concavity gall.

In the light of what we now know about bag galls the names *Exobasidium Azaleae, E. discoideum,* and *E. Rhododendri*

[1] *loc. cit.*

appear superfluous, for their galls pass through the concavity stage and the morphological characters of the fungi concerned differ in no respect from those of *E. Vaccinii.*

Exobasidium Cassandrae was based on a leaf concavity of *Cassandra calyculata.* The new host was the sole basis for this new name and its author closed his description with the comment, "perhaps this is only a form of E. Vaccinii." Since we now regard *E. Vaccinii* as able to infect many species of the *Ericaceae,* the host alone in this case (with the morphological characters of the fungus agreeing with those of *E. Vaccinii*) does not afford sufficient justification for regarding *E. Cassandrae* as distinct from *E. Vaccinii.*

Exobasidium Arctostaphyli was founded on a leaf spot on *Arctostaphylos pungens.* As in the case of *Exobasidium Cassandrae,* there is no evidence whatever that the fungus concerned is not *E. Vaccinii,* the characters of the fungus and its work being quite those of the latter species.

The usual errors in connection with the preceding series of synonyms which are grouped together in the second division of my table are due, it seems to me, to attaching to a strange gall form—a host product—the same weight which one would give to a toadstool, and to ignoring the true fructifications of the *Exobasidium* concerned. In the taxonomy of the *Hymenomycetes,* species are based upon differences in morphological characters. It is so remarkable an innovation in our taxonomic usage in this group of plants to propose a new species which has precisely the same morphological characters as a well-known and established one that it makes it incumbent upon, and an unusual opportunity for, an author so establishing a species to show conclusively the truth of the paradox that actually good and distinct species of *Hymenomycetes* have the same morphological characters. In all the cases which have been considered, no evidence tending toward such proof has been offered. In the above, I but express the views of many of the best mycologists, who have consistently regarded the above-mentioned Exobasidium names as synonyms of *E. Vaccinii.*

Winter[1] wrote of *Exobasidium Vaccinii* in Europe where there is a similar confusion as to species, "der Pilz erzeugt ausnahmslos Formänderungen der verschiedensten Art an den von ihm bewohnten Pflanzentheilen . . . . . Ich finde zwischen den einzelnen verschiedene Nährpflanzen bewohnenden Formen keine wesentlichen Unterschiede."

The specimens which I have studied show that we have in North America perhaps three species of *Exobasidium,* two of which are rare and are present in herbaria in so few specimens that present conclusions concerning them are somewhat tentative. These species are as follows:

1. *E. Vaccinii* (Fuck.) Wor.

This species is common and wide-spread and is parasitic on many ericaceous host plants. There is as yet no evidence of which I am aware tending to show that so-called physiological races or forms with parasitism limited to a particular host exist in this species. This fungus attacks leaves developing leafy shoots, and flowers of susceptible plants, making its most successful infections when these organs are very young. The vegetative hyphae live in the infected organs between the cells, which are stimulated by the presence and activities of the parasitic hyphae to make a more or less marked hypertrophic growth response, termed a gall. The galls are of varied and sometimes strange form according to the host, the organ, and its age. The distribution of the galls upon the host is dependent upon the susceptibility of its various organs to infection.

In fruiting, the hyphae push through the epidermis to the surface and produce there a resupinate fructification which is amphigenous in the case of galls from tissues so young that they form galls of wax-like or coralloid structure, and hypophyllous on the more common leaf galls. The fructification is variable in thickness, consisting sometimes of scattered clusters of basidia but usually with hyphae present in variable quantity between the basidia so that the fructification may attain a maximum thickness of 60–70 μ, as in the case of col-

[1] In Rabenhorst, Krypt. Flora 1[1]: 322. 1884.

lections on *Vaccinium vitis-idaea.* As shown by Richards,[1] these hyphae bear simple, acicular, conidia about 6–9×1–1½ μ. Conidia are nearly always present in the preparations but have been entered only occasionally in my table. The basidia are generally 4-spored. The basidiospores from herbarium specimens are colorless, simple or with some uniseptate, 10–20×2½–5 μ, but are usually about 12–18×3–3½ μ. They are sometimes a little shorter, or a little longer, or a little thinner, or a little thicker, but are so variable within the extremes stated for different collections on the same host within the same regions or distant regions—as will be seen by reference to my table—that a moderate latitude in spore dimensions seems evident.

2. *E. Vaccinii uliginosi* Boud.

The European specimen of this species distributed from Norway in Briosi and Cavara, 'Funghi Paras.,' 261, has a resupinate, hypophyllous felty fructification, 30–45 μ thick, which is composed almost wholly of large basidia, standing close together and presenting in sections the appearance of a distinct palisade layer. This fructification begins below the epidermis and tears the cells of the latter loose and apart from each other and carries them outward between the basidia. The hymenium is abundantly fruited with basidiospores, borne two to a basidium. The spores are simple, colorless, even, curved towards the base, 18–20×6–7 μ. No conidial hyphae could be found between the basidia in this specimen.

The specimen distributed in Eriksson, 'Fungi Par. Scand.,' 286a, has similar spores 16–20×8 μ. This specimen is in poorer condition and does not show basidia clearly. In some places the fructification is composed of very fine, short-celled hyphae, which are not bearing conidia. Both the above specimens are shoot galls with leaves felty below and reddened above.

Professor Piper, 443, collected on *Vaccinium membranaceum,* at Mt. Ranier, Washington, in August, a shoot gall similar to the European specimens and having a well fruited

[1] *loc. cit.*

Exobasidium with 2-spored basidia and spores 16–20×8 μ. The fungus agrees in all respects with the specimen in Briosi and Cavara, 261. Several other collections on *Vaccinium membranaceum* of buff colored leaf concavity and leaf spot galls appear to bear *Exobasidium Vaccinii*. The very thick spores, borne two to a basidium, distinguish *E. Vaccinii uliginosi* from *E. Vaccinii*.

3. *E. Symploci* Ell. & Mart.

This fungus attacks the developing leaf buds of *Symplocos tinctoria* and deforms them into a lobed mass. In fruiting, the hyphae protrude on the surface of the mass and bear acicular, simple, colorless, slightly curved conidia, ranging from about 7×1 μ upward. The largest spores are 24×2 μ, acicular, curved, and of the same form as those of intermediate size and so on down to attached conidia. I have not found any of the largest spores attached, nor have I found basidia. In the original description the reference to spore characters is "conidia hyaline, cylindric, nearly straight, 15–21×2 μ."

I conclude that basidia have yet to be demonstrated for this fungus.

As I have had an opportunity to examine a large number of Exobasidium specimens, collected in widely separated localities, on many hosts and at various times in the growing season, it has seemed that a concise summary of the data obtained in regard to each specimen might prove useful for comparison purposes to others who study our specimens of this genus in the future. Pains have been taken to give the hosts accurately. I am indebted to Dr. J. M. Greenman for aid in host determinations in several cases.

In the matter of spores the stated dimensions are those of the preparations which were studied. No effort was made to study preparation after preparation from the same collection in order to find spores possibly larger or smaller than those of the first preparation which showed the spores well. The dimensions stated are those obtained by treating all specimens in exactly the same way and give such results as herbarium specimens afford.

TABLE I

COMPARATIVE TABLE OF DATA CONCERNING SPECIMENS OF EXOBASIDIUM EXAMINED

Host	Spore measure	Gall	Date	Locality	Coll. or herb.
EXOBASIDIUM VACCINII (FUCK.) WOR. THE FOLLOWING HAVE BEEN REFERRED HERE INVARIABLY					
Vaccinium vitis-idaea	14–16.8×2.8 μ (Wor.)	Leaf spot, leaf concavity—scurfy or felty below and reddish above—shoot gall, flower gall.	May to Sept.	Russia	Woronin's article
	12–15×3–3½ μ	Leaf spot, leaf concavity—scurfy or felty below and reddish above.	July	Germany	Krieger, Fung. Sax., 62
	12–15×3 μ	Leaf concavity, felty below, red above.	Aug.	Sweden	Romell
	12–15×3–3½ μ	Same as preceding.	Aug.	Sweden	Burt
V. vacillans	12–14×3 μ	Many leaves, felty under, reddish above.	June	Mass.	Sey. & Earle, Ec. Fung., 137a
	12×2½–3 μ	Leaf spot, scurfy below, reddish above.	July	Mass.	Sey. & Earle, Ec. Fung., 137b
	12–15×3 μ	Leaf spot, felty below, red above.	July	Mass.	Sey. & Earle, Ec. Fung., 137c
	12–15×3–3½ μ	Many leaves, felty under, reddish above.	June	Md.	Barth., Fung. Col., 3324
	15×3 μ	Same as preceding.	May	D. C.	Barth., Fung. Col., 1728
	12–18×3–4 μ	Same as preceding.	May	Md.	Barth., Fung. Col., 3231
	Conidia 6–9×1 μ	Same as preceding.	May	Mo.	Mo. B. G. Hb., 4949
V. arboreum	15×3–3½ μ	Leaf spot, scurfy below, reddish above.	April	Ala.	Ala. Biol. Surv.
	12–15×3 μ	Same as preceding.	April	Ala.	Mo. B. G. Hb., 4975
V. pennsylvanicum	12–13×3 μ	Leaf spot, scurfy below, reddish above.	.....	Wis.	Mo. B. G. Hb., 4985
	11–13×3 μ	Leaf spot, felty below, reddish above.	Aug.	Wis.	Mo. B. G. Hb., 44414
	Immature	Leaf spot, scurfy below, reddish above.	.....	N. Bruns.	Mo. B. G. Hb., 44415
	11–13×3 μ	Same as preceding.	.....	Minn.	Mo. B. G. Hb., 44416
V. stamineum	12–15×3 μ	Leaf spot, scurfy below, dark red above.	April	Ala.	Ala. Biol. Surv.
	12–15×3–4½ μ	Same as preceding.	April	Ala.	Mo. B. G. Hb., 4976
	12×3 μ	Same as preceding.	May	Ala.	Mo. B. G. Hb., 4971
	12–15×3–3½ μ	Leaf spot, scurfy below, buff and red above.	June	N. Y.	Mo. B. G. Hb., 4991

	12–14×3–3½ μ	Leaf concavity, scurfy, yellowish buff.	Sept.	Wash.	Suksdorf, 448
	13–15×3 μ	Same as preceding.	Aug.	Wy.	Mo. B. G. Hb., 44413
V. membranaceum	15–19×4–5 μ	Barely a concavity, scurfy, yellowish buff and spots red margined.	Aug.	Wash.	Suksdorf, 504
	12–18×4–5 μ	Same as noted for preceding.	Sept.	Wash.	Suksdorf, 504
	Too immature.	Leaf spot, scurfy below, yellowish.	July	Idaho	Mo. B. G. Hb., 4989
	12–15×3–3½ μ	Shoot gall—all later leaves of shoot with whole of each felty below, reddish above.	June	Mass.	Bartholomew, Fung. Col., 3323
	Sterile	Leaf spot, leaf concavity, reddish above.	June	N. Y.	Mo. B. G. Hb., 4953
Gaylussacia frondosa	12–14×3 μ	Leaf spot, leaf concavity, reddish above.	July	N. Y.	Mo. B. G. Hb., 4957
	Sterile	Leaf concavity, scurfy below, red above.	May	Fla.	Mo. B. G. Hb., 44404
	14×3 μ	Leaf spot, scurfy below, buff colored.	Sept.	Mich.	Waite, 118
	Sterile	Leaf spot, scurfy below, buff or red above.	Sept.	Mass.	Mo. B. G. Hb., 4948
	Immature	Whole leaves, scurfy below, reddish above.	May	Va.	Barth., Fung. Col., 3232
	Conidia 6–9×1–1½ μ	Shoot gall—whole leaves felty below, green or slightly reddened above.	May	Md.	Barth., Fung. Col., 3523
	15×3–3½ μ	Leaf concavity, felty below, red above.	May	Md.	Barth., Fung. Col., 3430
	Conidia	Leaf concavity, shoot gall of the V. vitis-idaea coralloid type.	May	Md.	Barth., Fung. Col., 3429
G. resinosa	Immature	Shoot gall of coralloid type, flower gall.	June	Mass.	Seymour Herb., T54
	Sterile	Leaf concavity, felty below, red above.	July	Mass.	Sey. & Earle, Ec. Fung., 488
	Conidia 6–10×1–1½ μ	Leaf concavity, shoot gall with whole leaves felty under, reddened above.	July	N. Y.	Mo. B. G. Hb., 4781
	Conidia 6–9×1 μ	Shoot gall with whole leaves felty under, reddened above.	.....	Wis.	Mo. B. G. Hb., 4961

TABLE I (Continued)

Host	Spore measure	Gall	Date	Locality	Coll. or herb.
G. resinosa —continued	{ 10–12×2½–3 μ { Conidia 6–9×1–1½μ }	Shoot gall of coralloid type, leaf concavity, flower gall.	July	Maine	Seymour Herb., T55
	Conidia 6–8×1 μ	Shoot gall with whole leaves felty below.	.....	.....	Mo. B. G. Hb., 4946
Arctostaphylos uva-ursi	Sterile	Shoot gall with all leaves felty below, reddened above.	July	Wash.	Piper, 434
	12–15×3 μ	Shoot gall of the V. vitis-idaea coralloid type.	Aug.	Col.	Barth, Fung. Col., 2729
A. manganita	12×3 μ	Whole leaves felty below, reddened above.	July	Cal.	Seymour Herb.
A. nevadensis	16×4½ μ	Shoot gall of coralloid type.	July	Wash.	Suksdorf, 840
	12–14×3 μ	Shoot gall with all leaves felty below, dark red above.	Aug.	Wash.	Piper, 428
Arbutus Menziesii	12–15×2–4 μ	Leaf concavity, felty below, red above.	.....	Cal.	Ell. & Ev., N. Am. F., 1586b
Lyonia jamaicensis	15×3½ μ	Leaf concavity to leaf bags, drying reddish brown.	March	Jamaica	Mo. B. G. Hb., 44403
Rhododendron albiflorum	{ Spores soon 3-septate 15–22×4–6 μ { Basidia 4-spored	Leaf spots, scurfy below, buff colored.	Sept.	Wash.	Suksdorf, 841
	12–20×4–5 μ and as above	Leaf spots, scurfy below, buff colored.	Sept.	Wash.	Suksdorf, 449
R. canadense	Conidia	Leaf spot, scurfy below, reddish above.	Sept.	Newf.	Mo. B. G. Hb., 42608
		Same as preceding.	Aug.	Newf.	Mo. B. G. Hb., 4981
R. maximum	12–15×4 μ	Leaf concavity, red.	July	N. Car.	Mo. B. G. Hb., 4951

EXOBASIDIUM VACCINII (FUCK.) WOR. THE FOLLOWING SYNONYMS ARE BASED ON GALL FORMS AS STATED:					
Exobasidium Azaleae Peck, = E. discoideum Ell.					
Azalea nudiflora	15–16×3 μ	Terminal bags, lateral leaf bags.	May	Ala.	Ala. Biol. Surv.
	13–18×3–4½ μ	Leaf bag, scurfy leaf spots, reddish above.	May	Ala.	Mo. B. G. Hb., 4964
	Sterile	Leaf bag suspended by a point.	April	Ala.	Mo. B. G. Hb., 4963
	Sterile	Flowers modified into obconic galls.	June	Mass.	A. B. Seymour Herb.
A. cult. sp.	12–15×3–3½ μ	Flower and leaf bag galls.	June	Mass.	Sey. & Earle, Ec. Fung., 489
A. viscosa	13–18×3–3½ μ	Bag gall, suspended from leaf.	July	N. J.	E. & Ev., N. Am. F., 1718
	Sterile	Bag gall, suspended from leaf.	May	Miss.	Mo. B. G. Hb., 4970
	Conidia	Flower and leaf bag galls.	April	Miss.	Mo. B. G. Hb., 4960
	Sterile	Bag gall, suspended from leaf.	Aug.	Mass.	Mo. B. G. Hb., 44405
	18×3½ μ	Leaf spots, scurfy below, reddened above.	Sept.	Mass.	Mo. B. G. Hb., 44410
Exobasidium Rhododendri Cramer					
Rhododendron ferrugineum	12–15×3–3½ μ	Leaf concavity, bag gall suspended from leaf.	Sept.	Switz.	Rabenhorst, Fung. Eur., 1910
	13–15×3–4 μ	Bag gall, suspended from leaf.	Sept.	Germ.	Magnus, Mo. B. G. Hb.
	14×3 μ	Bag gall, suspended from leaf.	Aug.	Austria	Magnus, Mo. B. G. Hb.
	Sterile	Bag gall, suspended from leaf.	Aug.	Switz.	Kunze, Fung. Sel. Ex. 302
Exobasidium Peckii Halst.					
Andromeda Mariana	12–13×3 μ	Leaf concavity, reddened above; flower gall—flower organs all enlarged.	May	Fla.	A. B. Seymour Herb.
	11–15×3 μ	Same gall forms as the preceding.	May	Fla.	Mo. B. G. Hb., 4966
	12–18×3–4 μ	Same gall forms as the preceding.	June	N. Y.	Sey. & Earle, Ec. Fung., 487
	12–18×3–3½ μ	Leaf concavity, felty below, reddened above.	June	N. J.	Ell. & Ev., Fung. Col., 1210
	Conidia 6–9×1–1½ μ	Leaf concavity, reddened above.	June	Fla.	Mo. B. G. Hb., 4954
Lyonia ferruginea	16–18×4 μ	Flower gall, 2½×2½ cm.—all the organs present and proportionately enlarged.	May	Ga.	U. S. Dept. of Agr.

TABLE I (Continued)

Host	Spore measure	Gall	Date	Locality	Coll. or herb.
Lyonia ferruginea —continued	15×3½–4 μ	Same as above—3–5 cm. long, 1–2½ cm. thick.	June	Ga.	Mo. B. G. Hb., 4955
	12×3½ μ	Flower gall of same type as preceding.	April	Fla.	Mo. B. G. Hb., 4962
		Flower gall of same type as preceding.	.....	Fla.	Mo. B. G. Hb., 44409
Exobasidium Andromedae Peck					
Andromeda ligustrina	15–18×3–3½ μ	Bag gall, terminal on shoot.	June	Mass.	H. L. Jones
	15–18×3–3½ μ	Bag gall, terminal on shoot.	June	Mass.	Rush.
	Conidia	Bag gall, terminal on shoot.	June	Mass.	Duggar, Mo. B. G. Hb.
	17×3½ μ	Leaf bag, terminal bag.	June	N. Y.	Shear, N. Y. Fung., 117
	12–16×3 μ	Bag gall, terminal on shoot.	.....	N. J.	Ellis, N. Am. Fung., 107
	12–15×3½–4 μ	Bag gall in the place of a leaf.	April	Fla.	Mo. B. G. Hb., 44326
Menziesia glabella	10–13×2–2½ μ	Bag gall, terminal on shoot.	Aug.	Idaho	Piper, 772
	10–18×1½–2½ μ	Leaf concavity of E. Vaccinii type.			
Exobasidium Cassandrae Peck					
Cassandra calyculata	12–15×3–4 μ	Leaf concavity, felty below, red above.	.....	N. Y.	Peck, Ellis N. Am. F. 722
	12–15×3–4½ μ	Leaf concavity, scurfy below, red above.	.....	N. Y.	Clinton
	15×3½ μ	Leaf concavity, felty below, red above.	Aug.	Canada	Ell. & Ev. N. Am. F., 2312a
	15×3–4½ μ	Leaf concavity, felty below, red above.	July	Mich.	Trelease, Mo. B. G. Hb.
	12×3 μ	Whole leaf, felty below, red above.			
	Conidia	Shoot gall—all leaves felty under, reddish above.	.....	Newf.	Robinson & von Schrenk, Mo. B. G. Hb.
	14×3½ μ	Leaf spot, felty below, red above.	July	Russia	Fung. Rossiae Ex. 72
Exobasidium Arctostaphyli Harkn.					
Arctostaphylos pungens	12–17×3–5 μ	Leaf spot, scurfy below, red above.	.....	Cal.	Ell. & Ev., N. Am. F. 1586a
	12–18×4½ μ	Leaf spot, scurfy below, red above.	.....	Cal.	Harkness, Mo. B. G. Hb.

Exobasidium Cassiopes Peck					
Cassiope Mertensiana	12–13×3 μ	Shoot gall of the V. vitis-idaea coralloid type.	Aug.	Wash.	Suksdorf, 501
	12–13×3 μ	Shoot gall like the preceding.	Aug.	Wash.	Piper, 771
Exobasidium Oxycocci Rostrup					
Vaccinium macrocarpon	15×3–3½ μ Conidia 6–9×1–1½ μ	Shoot gall of the V. vitis-idaea coralloid type.	.....	Mass.	Minns in U. S. Dept. of Agr. Hb.
	12–15×3 μ	Shoot gall like the preceding.	Sept.	Mass.	Trelease, Mo. B. G. Hb.
	12×3 μ	Leaf spot, leaf concavity, scurfy, red above.	Aug.	Mass.	Ell. & Ev., N. Am. F. 2312b
V. intermedium	12–14×3 μ	Shoot gall of coralloid type.	June	Wash.	Piper, 39
Exobasidium Karstenii Sacc. & Trott. = E. Andromedae Karst. non Peck					
Andromeda polifolia	12×3 μ	Shoot gall, coralloid—all the leaves reddish livid.	July	Finland	Karsten
	12–15×3 μ	Shoot gall like the preceding	July	Finland	Thuem., Myc. Univ. 1110
	Sterile	Shoot gall like the preceding.	June	N. H.	Mo. B. G. Hb., 4778
Exobasidium Vaccinii myrtilli (Fuck.) Juel					
Vaccinium Myrtillus	13–15×3 μ	Shoot gall with all leaves felty below, reddened above.	June	Germany	Krieger, Fung. Sax. 665
	Conidia 6–9×1–1½ μ	Shoot gall like the preceding.	May	Germany	Thuem., Myc. Univ. 115
V. uliginosum	12–15×3–4½ μ	Leaf concavity; shoot gall like above.	July	Germany	Krieger, Fung. Sax., 768
	12–14×3 μ	Shoot gall with all leaves felty below, reddish above.	.....	Finland	Karsten
	10–12×3 μ	Shoot gall like the preceding.	.....	Sweden	Eriksson, Fung. Par., 286b
V. deliciosum	11–12×3 μ Conidia 6–8×1 μ	Shoot gall like the preceding.	Aug.	Wash.	Piper, 842
V. sp.	12–14×3–3½ μ	Shoot gall redder above than preceding.	Sept.	Wash.	Suksdorf, 447

TABLE I (Continued)

Host	Spore measure	Gall	Date	Locality	Coll. or Herb.
		EXOBASIDIUM VACCINII ULIGINOSI BOUD.			
Vaccinium uliginosum	18–20×6–7 μ Basidia 2-spored	Shoot gall with all leaves felty below, red above.	Aug.	Norway	Briosi & Cavara, Fung. Par., 261
V. Myrtillus	15–17×7–8 μ	Shoot gall like the preceding.	.....	Norway	Eriksson, Fung. Par., 286a
V. membranaceum	16–20×8 μ Basidia 2-spored	Shoot gall like the preceding.	Aug.	Wash.	Piper, 443
		EXOBASIDIUM SYMPLOCI ELLIS & MART.			
Symplocos tinctoria	7–14×1½–2 μ, perhaps all are conidia	Leaf bud gall, mass 3×2 cm.	March	Fla.	Ell. & Ev., N. Am. F., 1696
	As above	Same as preceding.	March	Fla.	Mo. B. G. Hb., 4968
	8–24×1½–2 μ, perhaps all are conidia	Same as preceding.	April	Ala.	Mo. B. G. Hb., 4969
	Immature	Same as preceding.	April	Ind.	Rhodes, Mo. B. G. Hb.

Systematic Summary

1. Exobasidium Vaccinii Fuck. ex. Wor. Naturforsch. Ges. Freiburg Verhandl. **4**: 397–416. *pl. 1–3.* 1867. Plate 21.

Fusidium Vaccinii Fuck. Bot. Zeit. **19**: 251. 1861.—*Exobasidium Andromedae* Peck, Buffalo Soc. Nat. Hist. Bul. **1**: 63. 1873; N. Y. State Mus. Rept. **26**: 73. 1874.—*E. Azaleae* Peck, Buffalo Soc. Nat. Hist. Bul. **1**: 63. 1873; N. Y. State Mus. Bul. **26**: 72. 1874.—*E. discoideum* Ellis, Torr. Bot. Club Bul. **5**: 46. 1874.—*E. Rhododendri* Cramer in Rabenh. Fung. Eur. 1910. 1875.—*E. Andromedae* Karst. in De Thuemen, Myc. Univ. 1110. 1878; Finland Natur och Folk Bidrag **37**: 153. 1882.—*E. Karstenii* Sacc. & Trott. in Sacc. Syll. Fung. **21**: 420. 1912.—*E. Cassandrae* Peck, N. Y. State Mus. Bul. **29**: 46. 1874.—*E. Arctostaphyli* Harkn. Calif. Acad. Sci. Bul. **1**: 30. 1884.—*E. Myrtilli* (Thuem.) Karst. Finlands Natur och Folk Bidrag **37**: 152. 1882.—*E. Vaccinii Myrtilli* (Fuck.) Juel, Svensk. Bot. Tids. **6**: 364. 1912.—*E. Oxycocci* Rostr. Bot. Tidsskr. **14**: 243. 1885.—*E. Cassiopes* Peck, N. Y. State Mus. Rept. **45**: 24. 1893.—*E. Peckii* Halst. Torr. Bot. Club Bul. **20**: 437. 1893.

Illustrations: Woronin. *loc. cit.*—Richards, Bot. Gaz. **21**: *pl. 6. f. 1–20.*—Petri, Ann. Myc. **5**: 342–346.—Brefeld, Untersuch. Myk. **8**: *pl. 1. f. 17–22.*—Duggar, Fung. Dis. *f. 215, 216.*—Shear, U. S. Dept. Agr., Bur. Pl. Ind. Bul. 110: *pl. 7. f. A–D.*—Juel, Svensk. Bot. Tids. **6**: 353–372. *f. A–C.*—Engl. & Prantl, Nat. Pflanzenfam. (**I.** 1**): 104. *f. 65.*—Other illustrations in many text-books. References to other illustrations in Sacc. Syll. Fung. **19**: 694.

Fructifications hypophyllous or amphigenous, resupinate, effused, scurfy or felty and compact, grayish, consisting of somewhat scattered clusters of basidia or of basidia and fine, suberect, more or less interwoven and branched hyphae which bear conidia and give to the fructification a maximum thickness ranging up to 60–70 μ; basidia with 4 sterigmata usually; basidiospores colorless, simple or with some 1-septate, 10–20$\times$2½–5 μ, but usually about 12–18$\times$3–3½ μ, becoming 3-septate in germinating; conidia simple, 6–9$\times$1–1½ μ.

Parasitic in leaves, young shoots, and flowers of various ericaceous hosts, and stimulating the infected parts to the production of leaf, shoot, or flower galls which bear the fructifications on their surface. Leaf galls are usually somewhat reddish on the upper side and bear the fructification on the lower side.

From Newfoundland to Florida and westward to California and Washington, also in Jamaica.

I have referred here, with some doubt, the *Exobasidium* causing yellow-buff leaf spot galls on *Rhododendron albiflorum,* collected on mountains in Washington by W. N. Suksdorf. The basidia are 20–30×6 μ, with 4 prominent sterigmata; the basidiospores are mostly 18–21×4½–6 μ, and are nearly all 3-septate. Some of these spores are germinating, hence the septation of the spores may possibly be due to their over maturity when collected, combined with weather conditions at that time favorable to germination. Other collections which show the full series of gall forms on this host are desirable and should give the needed information in regard to septation of the spores.

Specimens examined:

Exsiccati: Ellis, N. Am. Fung., 107, 722; Ell. & Ev., N. Am. Fung., 1586a, 1586b, 1718, 2312a, 2312b; Ell. & Ev., Fung. Col., 220, 1210; Bartholomew, Fung. Col., 1728, 2729, 3231, 3232, 3323, 3324, 3429, 3430, 3523; Seymour & Earle, Econ. Fung., 137a, 137b, 137c, 487, 488, 489; Shear, N. Y. Fung., 117; De Thuemen, Myc. Univ., 115, 210, 1110, 1808; Eriksson, Fung. Par., 286b; Jaczewski, Komarov & Tranzschel, Fung. Rossiae Ex., 72; Kunze, Fung. Sel. Ex., 302; Krieger, Fung. Sax., 62, 665, 768; Rabenhorst, Fung. Eur., 1910; Romell, Fung. Scand., 38.

Austria: On *Rhododendron ferrugineum,* Tyrol, *P. Magnus* (in Mo. Bot. Gard. Herb., 4988).

Germany: On *Vaccinium vitis-idaea,* Königstein, *Krieger,* Krieger, Fung. Sax., 62; Bavaria, *De Thuemen,* Myc. Univ., 910; on *Rhododendron ferrugineum, P. Magnus;* on *Vaccinium Myrtillus,* Leipzig, *G. Winter,* De Thuemen, Myc.

Univ., 115; Königstein, *Krieger,* Fung. Sax., 665; on *V. uliginosum,* Altenberg, *Krieger,* Fung. Sax., 768.

Russia: On *Cassandra calyculata,* Novgorod, Jaczewski, Fung. Rossiae Ex., 72.

Finland: On *Vaccinium uliginosum,* Mustiala, *P. A. Karsten;* on *Andromeda polifolia,* Mustiala, *P. A. Karsten;* and also in De Thuemen, Myc. Univ., 1110.

Sweden: On *Vaccinium vitis-idaea,* Femsjö, *L. Romell;* Upsala, *E. A. Burt;* on *Andromeda polifolia, L. Romell,* Romell, Fung. Scand., 38; on *Vaccinium uliginosum,* Eriksson, Fung. Par. Scand, 286b.

Switzerland: On *Rhododendron ferrugineum,* Luzern, *G. Winter* in Kunze, Fung. Sel. Ex., 302; same host, Maderaner Thal, *Cramer,* Rabenhorst, Fung. Eur., 1910.

Canada: on *Cassandra calyculata,* London, *J. Dearness,* Ell. & Ev., N. Am. Fung., 2312a.

Newfoundland: on *Cassandra calyculata,* Pennie's River, *B. L. Robinson & H. von Schrenk* (in Mo. Bot. Gard. Herb., 4779); on *Rhododendron canadense,* Bluff Head, *A. C. Waghorne, 940* (in Mo. Bot. Gard. Herb., 42608); Virginia Water, *B. L. Robinson & H. von Schrenk* (in Mo. Bot. Gard. Herb., 4981).

New Brunswick: on *Vaccinium pennsylvanicum, Hays, 16* (in Mo. Bot. Gard. Herb., 44415).

Maine: on *Gaylussacia baccata,* Biddeford, *Mrs. A. M. Pier* (in Seymour Herb., T55).

New Hampshire: on *Andromeda polifolia,* Shelburne, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 4778).

Massachusetts: on *Vaccinium vacillans,* Arlington, Magnolia, and Medford, *A. B. Seymour,* Sey. & Earle, Econ. Fung., 137a, 137b, 137c respectively; Plymouth, *E. Bartholomew,* Fung. Col., 3324; Weston, *A. B. Seymour, T56* (in Seymour Herb.); Rafes Chasm, *A. B. Seymour, T58* (in Seymour Herb.); Middlesex Falls, *J. G. Jack* (in Seymour Herb.); on *V. macrocarpon,* Woods Hole, *W. Trelease* (in Mo. Bot. Gard. Herb., 4982); Chatham, *Miss Minns,* and also (in U. S. Dept. Agr. Herb.); Harwich, *B.D.Halsted,* Ell.& Ev.,N.Am. Fung., 2312b; Waverly, *A. B. Seymour, T60* (in Seymour

Herb.); on *V. pennsylvanicum,* Rafes Chasm, *A. B. Seymour T59* (in Seymour Herb.); on *Gaylussacia frondosa,* Woods Hole, *W. Trelease* (in Mo. Bot. Gard. Herb., 4948); Plymouth, *E. Bartholomew,* Fung. Col., 3323; on *G. resinosa,* Manchester, *W. C. Sturgis,* Sey. & Earle, Econ. Fung., 488; Falmouth, *A. B. Seymour, T53* (in Seymour Herb.); Woods Hole, *A. B. Seymour, T54* (in Seymour Herb.); Dartmouth, *W. G. Farlow* (in Seymour Herb.); Brewster, *W. G. Farlow* (in Seymour Herb.); on *Andromeda ligustrina,* Cambridge, *Mr. Rush;* Dedham, *H. L. Jones,* and also *B. M. Duggar* (in Mo. Bot. Gard. Herb., 44411); Woods Hole, *W. Trelease* (in Mo. Bot. Gard. Herb., 44410); Hampden, *A. B. Seymour, T51* (in Seymour Herb.); Granville, *A. B. Seymour* (in Seymour Herb.); on *Rhododendron cult. sp.,* Brookline, *A. B. Seymour,* Sey. & Earle, Econ. Fung., 489; on *R. nudiflorum,* Granville, *A. B. Seymour* (in Seymour Herb.); on *R. viscosum,* Woods Hole, *W. Trelease* (in Mo. Bot. Gard. Herb., 44405, 44408).

New York: on *Vaccinium stamineum,* Ithaca, *W. Trelease* (in Mo. Bot. Gard. Herb., 4991); on *Gaylussacia frondosa,* Eastport, *J. Schrenk* (in Mo. Bot. Gard. Herb., 4953); Eastport, *H. von Schrenk* (in Mo. Bot. Gard. Herb. 4957); on *G. resinosa,* Deer Park, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 4781); on *Andromeda ligustrina,* Alcove, *C. L. Shear,* N. Y. Fung., 117; on *A. Mariana,* Westbury, *F. C. Stewart,* Sey. & Earle, Econ. Fung., 487; on *Cassandra calyculata,* Adirondack Mts., *C. H. Peck,* Ellis, N. Am. Fung., 722; Buffalo, *G. W. Clinton.*

New Jersey: on *Andromeda ligustrina, Ellis,* N. Am. Fung., 107; on *A. Mariana,* Newfield, *Ellis,* Ell. & Ev., Fung. Col., 1210; on *Rhododendron viscosum,* Newfield, *Ellis,* Ell. & Ev., N. Am. Fung., 1718; and (in Mo. Bot. Gard. Herb., 4959).

Maryland: on *Vaccinium vacillans,* Rosecraft, *Bartholomew,* Fung. Col., 3231; on *Gaylussacia resinosa,* Lanham, *E. Bartholomew,* Fung. Col., 3429, 3430; *Bartholomew & Swingle,* Fung. Col., 3523.

District of Columbia: on *Vaccinium vacillans,* Takoma Park, *C. L. Shear,* Fung. Col., 1728.

Virginia: on *Gaylussacia resinosa,* Vienna, *E. Bartholomew,* Fung. Col., 3232.

North Carolina: on *Rhododendron maximum, H. von Schrenk* (in Mo. Bot. Gard. Herb., 4951); on *R. nudiflorum, H. von Schrenk* (in Mo. Bot. Gard. Herb., 4950).

Georgia: on *Lyonia ferruginea,* Brunswick, comm. by U. S. Dept. Agr. Herb.; *W. Trelease* (in Mo. Bot. Gard. Herb., 4955).

Florida: on *Gaylussacia frondosa,* Dunedin, *S. M. Tracy, 6649* (in Mo. Bot. Gard. Herb., 44404); on *Andromeda ligustrina,* St. Leo, *Rev. Jerome* (in Mo. Bot. Gard. Herb., 44326); on *A. Mariana,* White Springs, *H. H. Hume, 88* (in Mo. Bot. Gard. Herb., 4966), and also (in Seymour Herb.); *Chapman* (in Mo. Bot. Gard. Herb., 4954); on *Lyonia ferruginea, Chapman* (in Mo. Bot. Gard. Herb., 44409).

Alabama: on *Vaccinium arboreum,* Auburn, *Ala. Biol. Surv.,* and also (in Mo. Bot. Gard Herb., 4975); on *V. stamineum,* Auburn, *Ala. Biol. Surv.,* and also (in Mo. Bot. Gard. Herb., 4976); Auburn, *F. S. Earle & L. M. Underwood* (in Mo. Bot. Gard. Herb., 4971); on *Rhododendron nudiflorum,* Auburn, *Ala. Biol. Surv.,* and also (in Mo. Bot. Gard. Herb., 4964, 4963).

Mississippi: on *Rhododendron viscosum,* Ocean Springs, *F. S. Earle* (in Mo. Bot. Gard. Herb., 4970); and *S. M. Tracy* (in Mo. Bot. Gard. Herb., 4960).

Michigan: on *Galylussacia frondosa,* Lansing, *M. B. Waite, 118* (in U. S. Dept. Agr. Herb.); on *G. resinosa,* Agricultural College, *G. H. Hicks* (in Seymour Herb.); on *Cassandra calyculata,* Republic, *W. Trelease* (in Mo. Bot. Gard. Herb., 4983); Agricultural College, *G. H. Hicks* (in Seymour Herb.).

Minnesota: on *Vaccinium pennsylvanicum,* Hokal, *L. H. Pammel* (in Mo. Bot. Gard. Herb., 44416).

Wisconsin: on *V. pennsylvanicum,* La Crosse, *L. H. Pammel* (in Mo. Bot. Gard. Herb., 44414); Kirtland, (in Mo. Bot.

Gard. Herb., 4985); on *Gaylussacia resinosa,* Kirkland (in Mo. Bot. Gard. Herb., 4961).

Missouri: on *Vaccinium vacillans,* Crystal City, (in Mo. Bot. Gard. Herb., 4949).

Wyoming: on *V. membranaceum,* Teton Mts., *A. Nelson, E. Nelson, 6525* (in Mo. Bot. Gard. Herb., 44413).

Idaho: on *V. membranaceum,* Forest, Nez Perces Co., *A. A. & E. G. Heller, 3465* (in Mo. Bot. Gard. Herb., 4989); on *Menziesia glabella,* Bitter Root Mt., *C. V. Piper, 772.*

Colorado: on *Arctostaphylous uva ursi,* Glacier Lake, *Bartholomew & Bethel,* Fung. Col., 2729.

Washington: on *Vaccinium deliciosum,* Mt. Rainier, *C. V. Piper, 842;* on *V. membranaceum,* Mt. Paddo, *W. N. Suksdorf, 448;* Chiquash Mts., *W. N. Suksdorf, 504;* on *Vaccinium sp.,* probably *V. membranaceum,* Mt. Paddo, *W. N. Suksdorf, 447;* on *V. intermedium,* Seattle, *C. V. Piper, 39;* on *Arctostaphylos uva ursi,* Orchard Point, *C. V. Piper, 434;* on *A. nevadensis,* Mt. Paddo, *W. N. Suksdorf, 840;* Longwire Springs, *C. V. Piper, 428;* on *Cassiope Mertensiana,* Chiquash Mts., Skamania Co., *W. N. Suksdorf, 501;* Olympic Mts., *C. V. Piper, 771;* on *Rhododendron albiflorum,* Chiquash Mts., Skamania Co., *W. N. Suksdorf, 841;* Mt. Paddo, *W. N. Suksdorf, 449.*

California: on *Arctostaphylos pungens, H. W. Harkness* (in Mo. Bot. Gard. Herb., 4972); and also Ell. & Ev., N. Am. Fung., 1586a; on *A. manganita,* Sisson's, Siskiyou Co., *W. C. Blasdale* (in Seymour Herb.); on *Arbutus Menziesii, H. W. Harkness,* Ell. & Ev., N. Am. Fung., 1586b.

Jamaica: on *Lyonia jamaicensis,* Cinchona, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 44403).

2. **E. Vaccinii uliginosi** Boud. Soc. Bot. Fr. Bul. **41**: CCXLIV. 1894.

Illustrations: Juel, Svensk. Bot. Tids. **6**: 353–372. *pl. 7. f. 5. text. f. D.*

Fructification hypophyllous, resupinate on the whole lower surface of the leaves, felty, 30–45 μ thick, composed of large basidia arranged side by side in a compact hymenium; basidia

with 2 sterigmata; spores colorless, even, curved towards the base, 16–20 × 7–8 μ.

Parasitic on *Vaccinium membranaceum,* which produces shoot galls with all the later leaves of the gall red on the upper side, felty below, and but slightly, if at all, deformed.

Mt. Rainier, Washington. August.

In the original description of this species, the spore dimensions are stated as 25–32 × 8–12 μ. The European specimens in the exsiccati cited below, which European authors refer here, have spores of the dimensions of the American collection. Shoot galls of the type stated are the only form known to be caused by this species, but other forms may yet be found.

Specimens examined:

Exsiccati: Briosi & Cavara, Fung. Par., 261; Eriksson, Fung. Par. Scand., 286a under the name *Exobasidium Vaccinii.*

Norway: on *Vaccinium Myrtillus,* Eriksson, Fung. Par. Scand., 286a; on *V. uliginosum, G. von. Lagerheim,* Briosi & Cavara, Fung. Par., 261.

Washington: on *Vaccinium membranaceum,* Mt. Rainier, *C. V. Piper, 443.*

3. **E. Symploci** Ell. & Mart. Am. Nat. **18**: 1147. 1884.

Fructification amphigenous, resupinate, effused, consisting of lax, slender, colorless hyphae which bear solitary conidia at the tips of very short, lateral, ascending branches; conidia colorless, even slightly curved, acicular, 7–24×1–2 μ; basidia and basidiospores unknown.

Parasitic on *Symplocos tinctoria* which produces bud galls 3–3½ cm. in diameter, lemon yellow, subglobose and sublobate.

Florida, Alabama, and Indiana. March and April.

In the original description it is stated that the galls are distorted flower buds. In a specimen collected in Indiana, the gall is a partially developed leaf bud.

Specimens examined:

Exsiccati: Ell. & Ev., N. Am. Fung., 1696.

Florida: on *Symplocos tinctoria,* Green Cove Springs, *G. Martin* (in Mo. Bot. Gard. Herb., 4968); and in Ell. & Ev., N. Am. Fung., 1696.

Alabama: on *Symplocos tinctoria,* Auburn, *Ala. Biol. Surv.* (in. Mo. Bot. Gard. Herb., 4969).

Indiana: on *Symplocos tinctoria,* Robertsdale, *A. M. Rhodes* (in Mo. Bot. Gard. Herb., 741178).

SPECIES IMPERFECTLY KNOWN

E. decolorans Harkness, Cal. Acad. Sci. Bul. **1**: 31. 1884.

"Receptaculum effused, producing conspicuous yellowish-white, orbicular spots, 1–2 cm. in diameter, not at all distorting the leaf; spores appearing upon the under surface, hyaline, straight, μ 7–8 $\times$ 4–5.

"On living leaves of Rhododendron occidentale. Tamalpais [Cal.]. Autumn. 2887."

The above is the original description. I have seen no specimens referable here nor on the host stated.

EXCLUDED SPECIES

E. mycetophilum Peck ex Burt, Torr. Bot. Club Bul. **28**: 285–287. *pl. 23.* 1901.

Tremella mycetophila Peck, N. Y. State Mus., Bul. **28**: 53. *pl. 1. f. 4.* 1879.

This curious structure on *Collybia dryophila,* I no longer regard as parasitic but, rather, as a teratological production of *C. dryophila,* induced by protracted wet weather during development of the fructification.

(To be continued.)

Explanation of Plate

PLATE 21.

This plate is a photographic reproduction, ×⅘, of Plate 1 by Woronin[1] of the various galls produced by *Vaccinium vitis-idaea* when parasitized by *Exobasidium Vaccinii*. The original plate is colored and with all figures natural size; red colors of the original have photographed light colored.

Fig. 1. Leaf spot gall, on left side of uppermost leaf; the leaf is reddish on the upper side in the infested area, not deformed, and was felty or scurfy on the lower side.

Figs. 2–9. Leaf concavity galls. More or less deformation of the infected region is present here.

Figs. 10–15. Shoot galls of the wax-like or coralloid type. Extended portions of leafy shoots are infected. Figure 11 shows whole branchlets completely hypertrophied.

Figs. 16–17. Flower galls borne on, and a part of, shoot galls.

Fig. 18. Flower gall. Local infection of a single flower, noted as the only such instance observed.

[1] *loc. cit.*

Fig. 1
Fig. 2
Fig. 3.
Fig. 5.
Fig. 9
Fig. 10
Fig. 11.
Fig. 6.
Fig. 4
Fig. 7.
Fig. 8
Fig. 14.
Fig. 13
Fig. 12.
Fig. 16.
Fig. 17.
Fig. 15.
Fig. 18.
M. Woronin del.
C. Lose lith

The Thelephoraceae of North America. V

Tremellodendron, Eichleriella, and Sebacina

EDWARD ANGUS BURT

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THE THELEPHORACEAE OF NORTH AMERICA V[1]

Tremellodendron, Eichleriella, and Sebacina

EDWARD ANGUS BURT

Mycologist and Librarian to the Missouri Botanical Garden
Associate Professor in the Henry Shaw School of Botany of Washington University

The group of fungi comprising the present part probably attains its greatest development both in form and numbers in the western continent where it culminates in the erect *Tremellodendron,* apparently confined to North America. This continent has five of the seven species of *Eichleriella;* it has twenty-six species of *Sebacina* against fifteen for the Old World.

The better-known species of these genera were originally described in *Thelephora, Stereum,* and *Corticium,* with which they conform so closely in general habit of growth and consistency of the fructification that it is impossible to separate them from the latter except by microscopic examination of preparations which show the mature basidia to be longitudinally cruciately septate. Collectors invariably roughly grade their findings of *Sebacina* as *Corticium.* The recognition of longitudinally septate basidia is not always easy with the aid of the microscope; for example, the fungus originally described as *Stereum Leveillianum* B. & C. has been studied critically at several times by experts without their observing the true structure of the basidia.

I regret that the present account of our species and their range in North America does not include all the material at hand. The Missouri Botanical Garden herbarium contains several hundred undetermined specimens of possible Corticiums which have been received during the last two years.

Note.—Explanation in regard to the citation of specimens studied is given in Part I, Ann. Mo. Bot. Gard. 1 : 202. 1914, footnote. The technical color terms used in this work are those of Ridgway, Color Standards and Nomenclature. Washington, D. C., 1912.

[1] Issued December 20, 1915

I have looked through these collections very carefully to sort out, without examination now of everything by microscopic methods, just those specimens which ought to be studied at once for citation in this part, but some of the specimens most desirable for citation have undoubtedly been deferred for the present as probable Corticiums.

As it is really a nice microscopical task to recognize longitudinally septate basidia when they are not at their best, some notes, based on my experience, may be helpful. Species of *Tremellodendron* are the most easily recognized, for a little of the moistened and softened hymenium may be picked out with a scalpel, placed in a drop of water, stained with aqueous solution of eosin, 7 per cent potassium hydrate solution added, and then crushed down by pressure on the cover glass. In the detection of species of *Eichleriella* and *Sebacina,* thin vertical sections of the fructification are necessary. After the sections have been made turgid and clear by potassium hydrate solution, the latter should be drained off and the sections stained by merely a sufficient amount of solution of Gruebler's eosin soluble in alcohol, and mounted in water for temporary examination. It may be necessary to spread apart the tissues of the preparation somewhat by pressure upon the cover glass. If the preparation is to be preserved permanently in glycerin, a drop of dilute solution of sodium chloride should be run under the cover glass before the glycerin is added to insure a permanent stain by the Gruebler eosin.

Longitudinally cruciately septate basidia are simple and pyriform or subglobose when young, but so are the probasidia of *Septobasidium,* the possible storage organs of *Corticium polygonium,* and the basidia of some species of *Corticium.* The basidia of the latter are likely to form a layer at the surface of the fructification and are certainly simple if any can be detected bearing sterigmata and perhaps spores while still non-septate. In a fructification having longitudinally septate basidia, the hymenial surface is usually composed of paraphyses and of long, slender sterigmata arranged side by side; in this surface layer—but sometimes at a con-

siderable distance from the surface, as in *Thelephora Helvelloides* Schw.—is situated the layer of basidia. Only very rarely do the basidia of *Sebacina* or *Eichleriella* constitute the surface of the fructification.

If a fructification contains a palisade layer of deeply staining, pyriform bodies among or underneath the paraphyses and with no simple basidia in the surface layer, more or less prolonged examination of the pyriform bodies is likely to show longitudinal septa in some of them.

The three genera which comprise the present part of this monograph, are treated here by the writer, because their general habit and consistency conform so closely with *Thelephoraceae* having simple basidia, that they may be regarded as a connecting group, although belonging with the *Tremellaceae* by the structure of their basidia. Such of the species as were described in the past were described as *Thelephoraceae* or by authors with special knowledge of the *Thelephoraceae;* the taxonomic recognition of fungi of these genera seems likely to continue to fall in the future to students of the *Thelephoraceae,* for other mycologists will hardly care to glean for material of so few species among the many *Thelephoraceae* of similar aspect.

TREMELLODENDRON

Tremellodendron Atkinson, Jour. Myc. **8**: 106. 1902; Saccardo, Syll. Fung. **17**: 208. 1905.

The type species is *Merisma candidum* Schw.

Fructifications coriaceous, erect, pileate, branched or rarely simple; hymenium amphigenous or inferior; basidia longitudinally cruciately septate; spores white, even.

The species of *Tremellodendron* are indigenous to North America; none have been reported for other regions, so far as I am aware. The fructifications spring up on the ground in deep woods during wet weather in summer and early autumn, and have the general habit of *Thelephora vialis,* of branched Clavarias, or, very rarely, of simple clubs. In active vegetative condition the fructifications may be distinguished from species of *Clavaria* of similar habit by coriaceous and

tough consistency and by lack of brittleness. The longitudinally septate basidia afford a decisive character in all doubtful cases.

The specific distinctions between the more common species of this genus are based largely upon the form of mature and well-developed fructifications; very young, deformed, or fragmentary specimens can not be referred very confidently to their species.

Key to the Species

Fructifications branched when well developed. Simple forms may be present when very young or in the same colony with normal branched forms 1
Fructifications simple 4
1. Fructifications normally cespitose, more or less grown together..... 2
1. Fructifications solitary or scattered..... 3
2. With pileate divisions flattened, grown together at many points of contact, forming rosette-like masses 2–15 cm. in diameter..*1. T. pallidum*
2. With the stems grown together into a main stem 2–10 mm. thick; pileate divisions cylindric, spreading, grown together at only few points of contact; the smaller divisions about 1½ mm. thick..... .....*2. T. candidum*
2. Sometimes with both stems and pileate divisions grown together into compact bundles, usually merely closely cespitose and with the branches intricately intertangled; much slenderer than preceding species and with the habit of *Pterula*.....*5. T. merismatoides*
3. Stem about 1½ mm. thick, palmately few-branched; branches once or twice similarly branched, cylindric or subcylindric, often channelled on the upper side; basidia 15×9 μ; spores 9–15×4½–6 μ, pointed at the base only .....*3. T. Cladonia*
3. Stem about ½–1 mm. thick, sometimes with occasional, scattered, divergent branches from its side, dilated at the upper end, divided into a few, short, finger-shaped branches; basidia 20–24×12–14 μ; spores 14–16×6–7 μ, pointed at both ends, Known from Jamaica only.....*4. T. tenue*
4. Fructification dark orange, probably with medullary tissue pale as in all the preceding species; basidia subglobose, 10–12 μ in diameter .....*6. T. aurantium*
4. Fructification black with the exception of the hymenium; hymenium olive-ocher, amphigenous on the lower third of the fructification; basidia 11×7 μ. Known from Porto Rico only.....*7. T. simplex*

1. **Tremellodendron pallidum** (Schw.) Burt, n. comb.

Plate 26, fig. 6.

Thelephora (*Merisma*) *pallida* Schw. Am. Phil. Soc. Trans. N. S. **4**: 166. 1834.—*T. Schweinitzii* Peck, N. Y. State Mus. Rept. **29**: 67. 1878; Saccardo, Syll. Fung. **6**: 534. 1888.—*Tremellodendron Schweinitzii* (Peck) Atk. Jour. Myc. **8**: 106. 1902.

Illustrations: Hard, Mushrooms *f. 381.*—Moffatt, Chicago Acad. Sci. Bul. 7: *pl. 22. f. 1.* 1909.

Type: in Herb. Schweinitz and a portion in Curtis Herb.

Fructification cespitose, erect, white or pallid, drying warm buff, stipitate by one to several or many stems which may be distinct below or arise from a common, swollen, basal mass; above, the stems branch into flattened, more or less furrowed, pileate divisions which grow together at surfaces of contact to form a somewhat cup-shaped or rosette-like mass; divisions in center of mass somewhat subulate at the apex, those at margin dilated and sometimes fimbriate, splitting when dry into sharp fibers or spicules; hymenium inferior, warm buff, best developed towards the base of the pileate divisions; basidia pyriform, longitudinally cruciately septate, 12–15 × 9 μ; spores from a spore collection, white, simple, 10–12 × 4½–5½ μ, and 9–12 × 4½ μ from an herbarium specimen.

Fructifications 2–10 cm. high, 2–15 cm. broad.

On the ground in deep woods. Canada to South Carolina and westward to Missouri. June to October. Common.

Full-grown and well-developed specimens are rosette-like and resemble *Thelephora vialis* when viewed from above but may have the pileate mass supported by many stems; small specimens with only a single stem do occur. The large specimens are apparently due to the concrescence of many small fructifications. In the large specimens the pileate divisions on the outside of the mass become broader and more flattened than those in the interior. The flattened form of the divisions of the pileus and their growing together at numerous points of contact are characters separating *Tremellodendron pallidum* from *T. candidum.* The small specimens, distributed as *T. pallidum* in published exsiccati, are often so immature and fragmentary that they cannot be distinguished from *T. candidum.*

Forms of *T. pallidum* which have the tips of pileate divisions split into sharp fibers or spicules are the *Thelephora cristata* and *T. serrata* of Schweinitz, 'Syn. N. Am. Fungi,' Nos. 621 and 623.

Specimens examined:

Exsiccati: Ravenel, Fungi Car. II, 29; Ellis, N. Am. Fungi, 510; Ell. & Ev., Fungi Col., 1208; Shear, N. Y. Fungi, 50.

Canada, Ontario: London, *J. Dearness,* and also in Ell. & Ev., Fungi Col., 1208; Belleville, *J. Macoun, 174, 230* (both in Can. Geol. Surv. Herb.).

Maine: N. Parsonfield, *R. G. Leavitt.*

Vermont: near Burlington, *L. R. Jones,* two collections; Middlebury, *E. A. Burt,* two collections.

Massachusetts: *Sprague, 773* (in Curtis Herb. under the name *Thelephora vialis*); Brookline, *S. Davis.*

Connecticut: East Hartford, *C. C. Hanmer;* and also No. 1567 (in Hanmer Herb.).

New York: Alcove, *C. L. Shear,* N. Y. Fungi, 50; Floodwood, *E. A. Burt;* Taughannock, *H. H. Whetzel,* Cornell Univ. Herb., 13600; Buffalo, *G. W. Clinton* (in U. S. Dept. Agr. Herb.); Tarrytown, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 42800).

New Jersey: Laning (in Mo. Bot. Gard. Herb., 701330, 701331, 701333); Newfield, *J. B. Ellis* (in Mo. Bot. Gard. Herb., 5162), and also N. Am. Fungi, 510.

Pennsylvania: Bethlehem, *Schweinitz,* type (in Herb. Schweinitz, and a portion in Curtis Herb. and also the Nos. 621 and 623 of Schweinitz, 'Syn. N. Am. Fungi,' under the names *Thelephora cristata* and *T. serrata,* respectively); Trexlertown, *W. Herbst* (in Lloyd Herb.); Kittanning, *D. R. Sumstine.*

Delaware: Newark, *H. S. Jackson, B10.*

District of Columbia: Washington, *O. F. Cook, 2,* comm. by P. L. Ricker.

Virginia: Great Falls, *C. L. Shear, 1044.*

North Carolina: Blowing Rock, *G. F. Atkinson,* Cornell Univ. Herb., 10666, 10667, 10669, 10664 (of which the first two numbers and part of the third are in Cornell Univ. Herb. and part of the third and the last in Mo. Bot. Gard. Herb.).

South Carolina: Ravenel, Fungi Car. II, 29.

Ohio: *C. G. Lloyd, 2346* (in Lloyd Herb.); Loveland, *D. L. James* (in U. S. Dept. Agr. Herb.).

West Virginia: Eglon, *C. G. Lloyd, 02601.*

Kentucky: *S. M. Price* (in Mo. Bot. Gard. Herb., 5141, 5144, 701332, 712372); Mammoth Cave, *C. G. Lloyd, 1071.*

Illinois: *H. C. Beardslee* (in Lloyd Herb., 2175); Newton's Ferry, *E. T. & S. A. Harper, 441;* Riverside, *E. T. & S. A. Harper, 696.*

Wisconsin: Blanchardville, Univ. of Wis. Herb., 52; Madison, *E. T. & S. A. Harper, 881; C. J. Humphrey, 948* (in Mo. Bot. Gard. Herb., 44783).

Iowa: *T. J. Fitzpatrick* (in Lloyd Herb.).

Missouri: St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 701335, 701370, 701371); Cliff Cave, *J. B. S. Norton* (in Mo. Bot. Gard. Herb., 5126); Columbia, *B. M. Duggar, 140;* Creve Coeur, *Miss E. M. Briggs* (in Mo. Bot. Gard. Herb., 44756).

2. T. candidum Schw. ex Atkinson, Jour. Myc. **8**: 106. 1902. Plate 26, fig. 3.

Merisma candidum Schweinitz, Naturforsch. Ges. Leipzig Schrift. **1**: 110. 1822.—*Thelephora candida* Fries, Elenchus Fung. 168. 1828; Schweinitz, Am. Phil. Soc. Trans. N. S. **4**: 166. 1834.

Type: in Herb. Schweinitz, Acad. Nat. Sci. Phila.

Fructifications cespitose, erect, coriaceous-soft, white, drying warm buff, stipitate; stem thick, palmately branched, with branches spreading, branching, cylindric or subcylindric; hymenium inferior on the main branches, often amphigenous on secondary branches; basidia longitudinally septate, 10–12 × 7½–9 μ; spores colorless, simple, even, 7½–10 × 4½–5½ μ.

Fructifications 2½–5 cm. high, 2–5 cm. broad; stem 2–10 mm. thick; smaller pileate branches about 1½ mm. thick.

On ground in open woods. Vermont to North Carolina and westward to Missouri. July to September. Infrequent.

The type of *T. candidum* has the dimensions given above for recent collections. In the original description Schweinitz noted that fructifications may attain a breadth of 15 cm.; at that time he had not given specific recognition to the large and common *T. pallidum* and it may be that the large specimens to which he referred were of the latter species. *T. candidum* is closely related to *T. pallidum* but contrasts with the latter in having consolidation between adjacent fructifications

confined to the main stems from the base upward to about the region of branching; from here the branches spread so that they grow together only rarely; furthermore, the branches are distinctly cylindric or subcylindric. The spores average a little shorter than those of related species.

Specimens examined:

Vermont: Lake Dunmore, *E. A. Burt;* Newfane, *C. D. Howe.*

Massachusetts: Woods Hole, *G. T. Moore.*

New York: Alcove, *C. L. Shear, 1218;* Fishers Island, *C. C. Hanmer, 192, 193, 194* (all in Hanmer Herb.).

North Carolina: *Schweinitz,* type (in Herb. Schweinitz); Blowing Rock, *G. F. Atkinson,* Cornell Univ. Herb., 10662, 10668 (in Mo. Bot. Gard. Herb., 44775, 44776) and (in Cornell Univ. Herb., 10663).

Ohio: Granville, *H. L. Jones.*

Missouri: near St. Louis, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 701336).

3. **T. Cladonia** (Schw.) Burt, n. comb. Plate 26, figs. 1, 2.

Merisma Cladonia Schweinitz, Naturforsch. Ges. Leipzig Schrift. 1:110. 1822.—*Thelephora Cladonia* Fries, Elenchus Fung. 168. 1828; Epicr. 537. 1836–1838; Schweinitz, Am. Phil. Soc. Trans. N. S. **4**:166. 1834; Saccardo, Syll. Fung. **6**:535. 1888.—*Thelephora gracilis* Peck, Torr. Bot. Club Bul. **25**:371. 1898.

Type: in Herb. Schweinitz.

Fructifications solitary or gregarious, erect, coriaceous-soft, pallid, drying warm buff, sometimes with the older portions pale olive-gray, stipitate; stem cylindric, palmately branched into a few—often three—cylindric branches, each or some of which occasionally branch again in similar manner; branches arranged in a plane from flattened end of stem or branch or in a circle about the cylindric end of the stem which is then sometimes perforate and the branches often channelled; hymenium amphigenous, or inferior when the branch is channelled; basidia longitudinally septate, pyriform, 15×9 μ; spores colorless, simple, even, curved, $9–15 \times 4\frac{1}{2}–6$ μ.

Fructifications 2½–5 cm. high, 7 mm.–2 cm. broad; stem about 1½ mm. thick.

On ground in woods. Canada to Mississippi and westward to Missouri. August and September.

The fructification of this species is smaller than that of *T. candidum* and has but few branches, which are often arranged in a circle about the end of the stem so as to appear somewhat proliferous on the margin of an imperfect cup as in some species of the lichen, *Cladonia*—hence the specific name—or with the branches standing up side by side from the compressed apex of the main stem. Both forms of branching have been found so associated in the same collection as to preclude the possibility of regarding this difference as a basis for two species. The branches are so frequently in threes that "trifaria" was contemplated as a name for the species by one author.

Specimens examined:

Canada: *J. Macoun, 78.*

Vermont: Smugglers Notch, *L. R. Jones;* Middlebury, *E. A. Burt;* Brattleboro, *C. C. Frost* (in Univ. Vermont Herb.).

Massachusetts: *Sprague, 871* (in Curtis Herb., 5762).

New York: Hague, *C. H. Peck, 7;* Ithaca, *G. F. Atkinson,* Cornell Univ. Herb., 7708.

Pennsylvania: Trexlertown, *W. Herbst* (in Lloyd Herb.).

District of Columbia: Takoma Park, *P. L. Ricker, 822* (in Ricker Herb.).

North Carolina: *Schweinitz,* type (Herb. Schweinitz and a portion in Curtis Herb.); Blowing Rock, *G. F. Atkinson* (in Cornell Univ. Herb., 10665, 10008. A part of the latter number is in Mo. Bot. Gard. Herb., 44774).

Georgia: Tallulah Falls, *A. B. Seymour,* Farlow Herb., O, P, Q, R, U, W (in Mo. Bot. Gard. Herb., 44619, 44623–44625, 44628, 44630).

Alabama: *F. S. Earle, 13,* type of *Thelephora gracilis* (in Coll. N. Y. State).

Mississippi: Biloxi, *Mrs. F. S. Earle, 32A.*

Ohio: Cincinnati, *A. P. Morgan* (in Lloyd Herb., 32); Loveland, *D. L. James.*

West Virginia: Eglon, *C. G. Lloyd, 02634.*
Missouri: Creve Coeur, *E. A. Burt* (in Mo. Bot. Gard. Herb., 44755).

4. **T. tenue** Burt, n. sp. Plate 26, fig. 7.

Type: in Burt Herb. and in N. Y. Bot. Gard. Herb.

Fructifications scattered, erect, very slender, coriaceous-soft, drying warm buff, stipitate; stem equal, flexuous, drying somewhat twisted and flattened, becoming fibrillose, sometimes giving off two or three scattered, divergent, small branches, dilated above and divided in a few palmately arranged, finger-shaped branches; hymenium inferior on the dilated portion and branches; basidia longitudinally septate, 20–24 × 12–14 μ; spores colorless, simple, even, curved, pointed at both ends, 14–16 × 6–7 μ.

Fructifications 2–3½ cm. high, 3 mm. broad; stem 1½–2½ cm. long, about ½–1 mm. thick.

On the ground in wet mountainous region, altitude 3000–5200 ft. Jamaica. December and January.

This species is characterized by its long and slender stem, few branches, and the largest basidia and spores of any species of the genus. The spores differ from those of the other species in being pointed at the apex.

Specimens examined:
Jamaica: Chester Vale, *W. A. & E. L. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 400, type; Cinchona, *W. A. & E. L. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 614.

5. **T. merismatoides** (Schw.) Burt, n. comb. Plate 26, fig. 4.

Clavaria merismatoides Schweinitz, Am. Phil. Soc. Trans. N. S. **4**: 182. 1834.—*Merisma Schweinitzii* Leveille, Ann. Sci. Nat. Bot. IV. **5**: 157. 1846.—*Lachnocladium merismatoides* (Schw.) Morgan, Cincinnati Soc. Nat. Hist. Jour. **10**: 193. 1888.—*Pterula merismatoides* (Schw.) Saccardo, Syll. Fung. **6**: 742. 1888.—*Thelephora merismatoides* Lloyd, Letter No. 26: 2. 1909. Nomen nudum.—*Tremellodendron merismatoides* Lloyd, Letter No. 40: 2. 1912. Nomen nudum.—*Thelephora pteruloides* Berk. & Curt., Hooker's Jour. Bot. **1**: 238. 1849; Grevillea **1**: 148. 1873.

Type: In Herb. Schweinitz, Acad. Nat. Sci. Phila.

Fructifications erect, cespitose or fasciculate, and sometimes with stems grown together, coriaceous, branched, pallid, drying with stems warm buff and branches tawny; branches few, rather straight, filiform, angular-terete; branchlets many, dilated and fimbriate at the apex, then splitting into spreading branchlets; hymenium glabrous, amphigenous; basidia longitudinally septate, pyriform, 12–15 × 8–9 μ; spores in preparations from herbarium specimens hyaline, even, simple, 8–10 × 4½–5 μ.

Cluster of fructifications 2–5 cm. high, 2–3 cm. broad. Individual from cluster has stem 5–10 mm. long, ½–1 mm. thick; branches about ¼–⅓ mm. thick.

On the ground in open woods. Massachusetts and New York to South Carolina and westward to Missouri. June to August.

This is a small species with the habit of a *Pterula* but with coriaceous structure and longitudinally septate basidia. The fructifications of a cluster may have their stems distant from one another by spaces equal to the diameter of the stems, but the branches interlock above; in other cases the fructifications are crowded closely together and united throughout their whole length. *T. merismatoides* may be distinguished from the preceding species by the smaller diameter of the stems and branches and from all the following species by its cespitose to fasciculate habit.

The collection from West Virginia, distributed as *Thelephora pteruloides* in Ell. & Ev., 'N. Am. Fungi,' 3415 and 'Fungi Col.,' 1117, has the hymenium composed of basidia standing side by side in a distinct palisade layer and the basidia not longitudinally septate in my opinion.

Specimens examined:

Massachusetts: near Boston, *Murray,* comm. by Sprague, 250 (in Curtis Herb. under the name *Thelephora pteruloides* B. & C.); Woods Hole, *G. T. Moore, 58.*

New York: Ithaca, *G. F. Atkinson, 37;* Fishers Island, *C. C. Hanmer, 1478* (in Hanmer Herb.).

New Jersey: Haddonfield, *T. J. Collins* comm. by C. G. Lloyd.

Pennsylvania: Bethlehem, *Schweinitz,* type (in Herb.

Schweinitz); York County, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 44742); Kittanning, *D. G. Sumstine.*

South Carolina: *M. A. Curtis, 1745* (the type and cotype of *Thelephora pteruloides* in Kew Herb. and Curtis Herb. respectively).

Ohio: Cincinnati, *A. P. Morgan,* Lloyd Herb., 2589 (determined by Morgan as *Thelephora filamentosa*).

Wisconsin: Lake Geneva, *E. T. & S. A. Harper, 842.*

Missouri: Meramec Highlands, *N. M. Glatfelter* (in Mo. Bot. Gard. Herb., 44743).

6. **T. aurantium** Atkinson, Ann. Myc. **6**: 59. 1908.

Type: in Cornell Univ. Herb. but cannot be found at present.

"Plants simple, slender, 1–3 cm. long, 2–3 mm. stout, dark orange, tough. Basidia subglobose, 10–12 μ, longitudinally divided; sterigmata 4, long, slender, flexuous. Spores oboval-subelliptical, granular, then with an oil drop, 7–10 $\times$ 5–6 μ, white, hyaline.—C. U. herb., No. 10684, ground, woods, along small stream crossing Boone Road, Blowing Rock, Blue Ridge Mts., N. C. G. F. Atkinson, Aug. 19–Sept. 22, 1901."

—Original description.

T. aurantium differs from the preceding species of *Tremellodendron* by its simple fructifications. I have seen no specimens referable here. Professor Atkinson had intended to make a negative from his type so that I could include a figure of the species, but, upon going to the envelopes labelled *T. aurantium,* he found that they contained—by error of a helper—*T. merismatoides* instead. The specimens of *T. aurantium* have not been found.

7. **T. simplex** Burt, n. sp. Plate 26, fig. 5.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructifications scattered, erect or suberect, drying hard, brittle, somewhat longitudinally wrinkled and sometimes compressed, black above, olive-ocher with the hymenium towards the base; hymenium amphigenous on the lower third of the fructification, olive-ocher, hyaline under the microscope, with surface consisting of colorless clavate paraphyses 5 μ thick,

and with basidia and spores at base of the paraphyses; basidia longitudinally septate; 11 × 7 μ; spores colorless, even, 7½–9 × 5–6 μ.

Fructifications about 2 cm. long, about 2 mm. thick.

In cane field. Porto Rico.

T. simplex is noteworthy by the column composed of longitudinally arranged, black hyphae, which extends the whole length of fructification and constitutes the whole, upper, sterile two-thirds of the fructification and is clothed by the ochraceous hymenium on the lower third. The specimens are broken off at the base, hence I cannot be sure that a stem was not originally present, but if present it would doubtless have been included in the packet. The general habit is that of a small *Geoglossum* or cylindric *Xylaria.*

Specimens examined:

Porto Rico: *J. R. Johnston,* comm. by W. G. Farlow, type (in Mo. Bot. Gard. Herb., 5119).

EICHLERIELLA

Eichleriella Bresadola, Ann. Myc. 1:115. 1903.—*Hirneolina* as a section of *Sebacina* Patouillard, Essai Taxon. 24. 1900.—*Hirneolina* (Pat.) Saccardo, Syll. Fung. 17: 208. 1905.

Fructifications coriaceous, waxy or membranaceous, subgelatinous, cup-shaped or plano-concave, rarely pendulous, hymenium typically superior, discoid, inferior in pendulous forms, even or somewhat rugulose; basidia globose-ovoid, cruciately divided, with 2–4 sterigmata; spores hyaline, cylindric, somewhat curved. It is a *Stereum* or *Cyphella* with tremellaceous hymenium.

The type species of the genus is *Eichleriella incarnata* Bres.

The original definition of *Eichleriella,* which is translated above, should be broadened to accurately describe our North American species, which are as coriaceous as *Stereum spadiceum.* All have the hymenium inferior. *Eichleriella gelatinosa* is our only species with subgelatinous hymenium.

But few species of this genus are known. Five species of *Eichleriella* have been recognized up to the present time in North America, three in Europe, and two in South America;

of our five, only one species, *Eichleriella Leveilliana,* ranges through the eastern United States; *E. spinulosa* occurs in both Europe and North America.

Key to the Species

Fructifications gray, small, ½–2 mm. long, ½–1 mm. broad, with habit of *Cyphella* ..... *1. E. Schrenkii*

Fructifications the color of raspberries and cream, and peltate at first, 1–5 cm. long, ½–1½ cm. broad..... *2. E. Leveilliana*

Fructifications ochraceous buff, 200–300 μ thick; hymenium even; known from Cuba and Brazil..... *3. E. alliciens*

Fructifications wood-brown, with whitish margin; hymenium dry, with tubercules like *Radulum*..... *4. E. spinulosa*

Fructification white at first, then clay-color, tomentose, soft and spongy, ½ cm. thick; hymenium gelatinous; known from Jamaica only..... *5. E. gelatinosa*

1. Eichleriella Schrenkii Burt, n. sp. Plate 27, fig. 8.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructifications gregarious, coriaceous, sessile, pezizoid, oblong or rotund, margin free and strongly inrolled, pubescent, smoke-gray; hymenium concave, pale smoke-gray to pallid neutral gray; basidia longitudinally septate, pyriform, 22 × 11 μ; spores white in collection on slide, simple, curved, pointed at base, 12–19 × 6–7½ μ.

Fructifications ½–2 mm. long, ½–1 mm. broad, ½ mm. thick.

On bark of dead limbs of *Prosopis* (mesquite). San Antonio, Texas. February.

The general habit of this fungus resembles that of very small specimens of *Corticium Oakesii,* of large species of *Cenangium,* or of a sessile *Cyphella;* from all of which *Eichleriella Schrenkii* is easily separated by its longitudinally septate basidia which show clearly in sectional preparations. The fructifications are much smaller than those of any other species of this genus heretofore described.

Specimens examined:

Texas: San Antonio, *H. von Schrenk,* type (in Mo. Bot. Gard. Herb., 42579), and also (in Mo. Bot. Gard. Herb., 42580).

2. E. Leveilliana (Berk. & Curtis) Burt, n. comb. Plate 27, fig. 9.

Corticium Leveillianum Berk. & Curtis, Hooker's Jour.

Bot. 1:238. 1849.—*Stereum Leveillianum* Berk. & Curtis, Grevillea 1:163. 1873.

Type: type and cotype in Kew Herb. and in Curtis Herb., respectively.

Fructification coriaceous, soft, dry, rather thick, vinaceous fawn at first, whitening with age, resupinate-effused, with the margin free, sometimes narrowly reflexed, concolorous, minutely tomentose; hymenium composed of a surface layer about 30 μ thick of paraphyses $1\frac{1}{2}$–2 μ in diameter and of a layer of basidia under this; basidia longitudinally septate, 10–18 $\times$ 6–12 μ; spores in spore collection, white, simple, curved, pointed at base, 12–16 $\times$ 5–6 μ.

Fructifications often 5 mm. in diameter at first, finally up to 1–5 cm. long, $\frac{1}{2}$–$1\frac{1}{2}$ cm. broad, about $\frac{1}{2}$ mm. thick.

On dead limbs of several species. New York to Texas, Cuba, Jamaica, Central America, and Brazil. November to May.

This is a well-marked species upon which Berkeley made the following excellent graphic comment:

"At first forming little peltate orbicular spots, which, as they dilate, become closely attached to the matrix, with the exception of the margin, which is often free, soon confluent, soft, rather thick; of the colour of raspberries and cream. Hymenium often minutely pitted. Old specimens lose in great measure their ruddy hue, and are of a dead white."

I have seen no specimens having the hymenium minutely pitted.

Specimens examined.

Exsiccati: Ravenel, Fungi Car. II, 35.

New York: Hudson Falls, *S. H. Burnham* (in Mo. Bot. Gard. Herb., 44009, 44170, 44194); Buffalo, *G. W. Clinton.*

South Carolina: *M. A. Curtis, 1220, 92* (types and cotypes in Kew Herb. and Curtis Herb., respectively); *Ravenel,* Ravenel, Fungi Car. II, 35.

Georgia: Tallulah Falls, *A. B. Seymour,* Farlow Herb., C (in Mo. Bot. Gard. Herb., 44608).

Texas: Austin, *W. H. Long, 570,* Cornell Univ. Herb.; San

Antonio, *A. B. Langlois, bd;* same locality, *H. von Schrenk* (in Mo. Bot. Gard. Herb., 42576).

Cuba: San Diego de los Baños, *Earle & Murrill, 296, 356 in part,* N. Y. Bot. Gard. Herb.

Jamaica: Cinchona, *W. A. & E. L. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 493.

Brazil: Blumenau, *A. Möller,* comm. by G. Bresadola; Matto Grosso Cuyaba, *G. Malme, 599,* comm. by L. Romell.

3. **E. alliciens** (Berk. & Cooke) Burt, n. comb.

Plate 27, fig. 10.

Stereum alliciens Berk. & Cooke, Linn. Soc. Bot. Jour. **15**: 389. 1876; Massee, Linn. Soc. Bot. Jour. **17**: 201. 1891.

Type: in Kew Herb.

Fructification coriaceous, resupinate, sometimes narrowly reflexed, separable, ochraceous buff, the margin slightly paler, the reflexed portion tomentose; structure in section, 200–300 μ thick, (1) with hyphae next to substratum ochraceous, loosely interwoven and protruded, 3 μ in diameter, similar to those on outer surface of reflexed portion, (2) with intermediate layer 100–180 μ thick, composed of longitudinally arranged hyphae 2 μ in diameter, (3) with hymenium composed of basidia 10 μ below the surface, imbedded in jelly through which rise a few filiform paraphyses or hyphae to the surface; hymenium even, ochraceous buff; basidia longitudinally cruciately septate, pyriform, 12–15 $\times$ 9–10 μ; spores colorless, simple, even, curved, 10–13 $\times$ 3½–5 μ.

Fructifications of type described as several inches long, originally orbicular; Cuban specimen 1 cm. long, 1 cm. broad, reflexed side 1–2 mm. long, 1 cm. broad.

On dead wood in virgin forest. Cuba and Brazil. March.

The fructification resembles in habit and coloration that of a resupinate specimen of *Stereum hirsutum* with a very narrowly reflexed margin. The Cuban collection, of which but a single fructification was communicated to me, is much smaller than the Brazilian type and has the hyphae of the intermediate layer with gelatinously modified wall.

Specimens examined:

Brazil: San Antonio da boa vista, Rio Javary, *Traill, 1,* type (in Kew Herb.).

Cuba: San Diego de los Baños, Pinar del Rio Province, *Earle & Murrill, 405,* N. Y. Bot. Gard. Herb.

4. **E. spinulosa** (Berk. & Curtis) Burt, n. comb.

Plate 27, fig. 11.

Radulum spinulosum Berk. & Curtis, Grevillea **1**: 146. 1873. —*Radulum deglubens* Berk. & Broome, Ann. and Mag. Nat. Hist. IV. **15**: 32. 1875.—*Eichleriella deglubens* (Berk. & Br.) Lloyd, Letter No. 45: 7. 1893; Wakefield, Brit. Myc. Soc. Trans. **4**: 305. 1914.—*Stereum rufum* of English authors but not *S. rufum* Fries.—*Radulum Kmetii* Bresadola, I. R. Accad. degli Agiati Rovereto Atti III. **3**: 102. 1897.—*Eichleriella Kmetii* Bresadola, Soc. Myc. France **25**: 30. 1910.

Type: in Kew Herb.

Fructifications longitudinally and broadly effused, wood-brown, coriaceous-soft, separable, with the margin whitish, finally narrowly reflexed on the upper side and tomentose, or with margin everywhere free and curved outward; hymenium wood-brown, dry, usually bearing tubercules singly or in small clusters, with pale tips; basidia longitudinally septate, clavate, 25–36×9 μ, arranged between paraphyses with brown tips; spores simple, colorless, cylindric, curved, 15–16 × 6 μ.

Fructifications range up to 6 cm. long by 1–2 cm. wide and may be larger by confluence, about 700 μ thick; tubercules about $\frac{1}{2}$–1 mm. long.

Alabama. On bark of dead *Populus trichocarpa,* Idaho, and Oregon. July to September.

This species is distinguished by having a hymenium with configuration of a *Radulum* and cruciate basidia. The tubercules are often simple and cylindric, sometimes deformed and multifid. The wide distribution and yet the extremely local occurrence of this species together with the absence, until recently, of observations on its basidia have resulted in a very interesting synonymy. It is remarkable that this species, which occurs on *Fraxinus, Populus,* etc., in several countries of Europe, should have been collected in the United

States in Alabama, Idaho, and Oregon only. I am greatly indebted to Mr. L. Romell for a preparation from the type of *Radulum spinulosum* which makes possible the reference to this species.

Specimens examined:

Sweden: Stockholm, *L. Romell, 327,* and three unnumbered collections.

Alabama: *Peters,* Curtis Herb., 4543, preparation from type (in Kew Herb.).

Idaho: Kaniksu National Forest, Priest River, *J. R. Weir, 55.*

Oregon: Eugene, *C. J. Humphrey, 1103.*

5. **E. gelatinosa** Murrill, n. sp. Plate 27, fig. 12.

Type: in N. Y. Bot. Gard. Herb. and in Burt Herb.

Fructification coriaceous, effuso-reflexed, white when young, finally clay-colored, tomentose, soft to the touch, margin obtuse; context soft, spongy, zonate; hymenium tough, gelatinous, drying Hay's brown, even; basidia longitudinally septate, 13 × 11 μ; spores simple, colorless, even, flattened on one side, 8–10 × 6 μ.

Reflexed portion of fructification 1½–2 cm. long, 2½ cm. wide, ½ cm. thick.

On rotting wood in wet, wooded regions. Jamaica. December and January.

Only two collections of one fructification each were made. That of December 17 is a white, young specimen, with no basidia developed, which shows the general habit and early characters of the species, but would not have been determinable except for the later collection of January 12–14, which shows the darker coloration assumed at maturity. The thick, spongy, soft pileus of the mature fructification distinguishes this species from others known at present.

Specimens examined:

Jamaica: Troy and Tyre, Cockpit country, *W. A. Murrill & W. Harris,* N. Y. Bot. Gard., Fungi of Jamaica, 1087, type (in N. Y. Bot. Gard. Herb.), a portion in Burt Herb.; Blue

Hole, Priestman's River region, *W A. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 180, immature specimen.

SEBACINA

Sebacina Tulasne, L. R. and C., Ann. Sci. Nat. V. **15**: 223–226. *pl. 10. f. 6–10.* 1872; Linn. Soc. Bot. Jour. **13**: 35. 1873; Brefeld, Untersuch. Myk. **7**: 102–106. *pl. 6. f. 22–26.* 1888; Patouillard, Essai Taxon. Hym. 24, 25. 1900 (with the exclusion of section *Hirneolina*).—*Exidiopsis* Brefeld, Untersuch. Myk. **7**: 94. *pl. 5. f. 20–22.* 1888.—*Stypella* Möller, A., Bot. Mitth. a. d. Tropfen. 8, Protobasidiomyceten 166. *pl. 4. f. 6, 7.* 1895.

Fructification coriaceous, membranaceous or floccose, gelatinous, waxy or pulverulent, resupinate, with habit of *Corticium;* basidia longitudinally septate, close together or scattered, sometimes between bushy conidiophores; spores colorless, producing in germination a similar spore or a cluster of conidia.

The type species of the genus is *Corticium incrustans* Pers.

Sebacina incrustans occurs sometimes on the ground and incrusting herbaceous stems and various erect objects but is often on decaying wood; *S. Helvelloides* occurs on the ground and incrusting erect objects; *S. chlorascens* has been observed incrusting the mossy bases of living trees; the other species have been recorded only on dead wood and bark. A few members of this genus are thick and spongy and were originally included in *Thelephora;* usually the species are thin and *Corticium*-like in general habit and were in several instances published under *Corticium.* In the dried conditions some species of *Sebacina* may be tentatively recognized as such by having the hymenial surface glassy or resembling dried cartilage; but such a separation from *Corticium* is very uncertain, for some species of *Sebacina* dry with a dull, soft surface and some true Corticiums assume the appearance of dried cartilage in drying.

It seems probable that it will always be difficult to determine resupinate species of *Hymenomycetes;* it is not possible to do so from the descriptions alone of the earlier botanists. European authors have recently been enlarging such descrip-

tions by giving spore characters, dimensions of basidia, cystidia, and hyphae, and the presence or absence of clamp connections. Such additional characters may often be obtained quickly by microscopic examination of a portion of the fructification which has been teased out and crushed down in dilute potassium hydrate solution; by these helpful additional characters, some species may be recognized with reasonable accuracy, but there are comparatively few such species. Structure in section of the fructification affords important characters for the identification of resupinate species. In practical work with these species, a microscopical mount of a sectional preparation of a type specimen is the next best thing for purposes of comparison to having the type itself.

My method of determining a resupinate specimen is to observe closely its general habit and characters, such as consistency, adnation, thickness, surface, margin, substratum, and color. Color is an important character when given in terms of an adequate color standard. The color which the specimens retain in drying is often the only color character available; it is more constant, fortunately, than is commonly appreciated, for it has to be the color factor in the comparison of herbarium specimens. The preliminary observation may suggest that the species is one of several of somewhat similar habit which may be of the same genus or of various genera. The sectional preparations, which are now made, may present (*a*) a uniform, homogeneous arrangement of similar hyphae from substratum to hymenium, (*b*) dissimilar hyphae or organs distributed uniformly throughout the whole fructification, (*c*) a layered, heterogeneous arrangement of various types with the layers more or less sharply differentiated from one another, (*d*) a stratose arrangement having the first stratum extend from the substratum to the upper surface of the first hymenium, the second stratum a repetition of the first and borne on the first, and so on. Under *a* there are characteristic varieties of structure, constant for each species, such as all the hyphae in erect position extending from substratum to hymenial surface, or all interwoven, or all procumbent, and there are also constant

differences in regard to whether the hyphae are crowded close together or are loosely arranged. Under *c*, a conspicuous example would be one in which the layer next to the substratum is composed of longitudinally arranged hyphae (that is, parallel with the substratum) crowded closely together; from this layer, a few branches might extend outward at right angles to the first layer and form a layer of loosely arranged, erect hyphae — the second layer; the hyphae of the second layer might branch abruptly at its outer surface and bear a compact hymenial layer. Some species invariably form a loosely interwoven layer next to the substratum, and on the surface of this layer form a dense hymenial layer, as, for example, *Sebacina incrustans, S. chlorascens,* and *S. Helvelloides.* Sterile fructifications may frequently be determined by their general characters and structure in section.

The preparations which reveal structure in section, give also spores, basidia, paraphyses, and other organs. From the combination of general characters, structure in section, and details of spores and noteworthy organs, the species becomes manifest. Our species of *Sebacina* are described in accordance with this method in the following pages.

Key to the Species

Fructifications on the earth, running up and incrusting the bases of living stems and trunks as well as dead objects 1
Fructifications confined to bark and wood of dead branches and trunks... 2

1. Sometimes passing into branches or ascending flaps; hymenial layer drying warm buff, 60–150 μ thick; paraphyses densely crowded and somewhat interwoven or adglutinated ..... *1. S. incrustans*
1. Pileate branches drying cream-color with a glaucous tint, imbricated, the apices spiculose or fimbriate; hymenial layer drying vinaceous brown, 140–240 μ thick ..... *3. S. chlorascens*
1. Not forming free branches or flaps; hymenial layer 200–300 μ thick; paraphyses straight and rod-like; basidia 20–25×15 μ ..... *4. S. Helvelloides*
2. Fructifications white or whitish when dry 3
2. Fructifications not white 4
3. Hymenium composed of unbranched, flexuous, even-walled, deeply staining, clavate organs 40–45×6 μ, in addition to few-branched paraphyses and basidia ..... *5. S. Shearii*
3. Hymenium composed of paraphyses and basidia; fructification 300–400 μ thick; margin thick, not closely adnate to substratum ..... *6. S. macrospora*
3. Hymenium composed of basidia and paraphyses; fructification 50–150 μ thick, shining white at first; margin very thin and closely adnate..7. *S. calcea*
3. Hymenium composed of basidia and paraphyses; fructification 200–300 μ thick, dirty whitish; hyphae incrusted in upper two-thirds of fructification; margin thin and closely adnate ..... *8. S. monticola*

4. Drying ochroleucous, basidia at or near the surface in tissue not sharply differentiated as a layer from tissue near substratum; much crystalline matter about 100 μ below surface. On *Alnus*, South Carolina ..... *9. S. scariosa*
4. Drying some variety of brown 5
4. Drying fuscous to black 6
5. Drying cacao-brown (testaceous of Saccardo's 'Chromotaxia'); separable from substratum; resembling *S. incrustans* but with margin soon detached and spores 6–7×4½–5 μ. On juniper, Alabama ..... *2. S. deglubens*
5. Blue-purple when fresh, drying tawny olive to Saccardo's umber where directly on the wood; adnate to substratum; 30–45 μ thick; basidia 7–10×6–8 μ; spores 6–7×3–5 μ ..... *10. S. podlachica*
5. Drying cinnamon-brown; adnate to substratum; 100–140 μ thick; scattered paraphyses with bushy-branched, brown tops rise 45–60 μ above the basidia. On *Magnolia*, Delaware ..... *11. S. cinnamomea*
6. Hay's brown when moist, drying fuscous, the margin pale cartridge-buff; separable from substratum; 500–600 μ thick. On *Populus*, Idaho ..... *12. S. adusta*
6. Drying blackish plumbeous; adnate to substratum; 150–200 μ thick, the margin indeterminate. On *Populus*, Washington ..... *13. S. plumbea*
6. Grayish when moist, drying dark mouse-gray and shining; adnate to substratum; 50–160 μ thick, the margin indeterminate. On very rotten wood, New England ..... *14. S. atrata*

1. **Sebacina incrustans** Pers. ex Tulasne, Ann. Sci. Nat. Bot. V. **15**: 225. *pl. 10. f. 6–10.* 1872; Linn. Soc. Bot. Jour. **13**: 36. 1873. Plate 27, fig. 13.

Corticium incrustans Persoon, Obs. Myc. **1**: 39. 1796.—*Thelephora incrustans* Persoon, Syn. Fung. 573. 1801; Fries, Syst. Myc. **1**: 448. 1821.—*Thelephora sebacea* Persoon, Myc. Eur. **1**: 155. 1822; Fries, Elench. Fung. **1**: 214. 1828; Hym. Eur. 637. 1874; Saccardo, Syll. Fung. **6**: 540. 1888.—*Corticium sebaceum* Massee, Linn. Soc. Bot. Jour. **27**: 127. 1891.—*Merisma cristatum* Persoon, Syn. Fung. 583. 1801.—*Thelephora cristata* Fries, Syst. Myc. **1**: 434. 1821; Hym. Eur. 637. 1874; Saccardo, Syll. Fung. **6**: 539. 1888.—*Sebacina incrustans* Tul. ex Bresadola, in part (Hym. Hung. Kmet.), I. R. Acad. Sci. Agiati III. **3**: 117. 1897.

Illustrations: Tulasne, *loc. cit.*—Persoon, Com. Fung. Clav. *pl. 4. f. 4;* Berkeley, Outlines Brit. Fung. *pl. 17. f. 6;* Brefeld, Untersuch. Myk. **7**: *pl. 6. f. 22–26.* Hennings in Engl. & Prantl, Nat. Pflanzenfam. (**I.** 1 **): 91. *f. 59 C, D;* Nees, System *pl. 34. f. 256 B;* Patouillard, Tab. Anal. Fung. *f. 155;* and Essai Tax. Hym. 25. *f. 17 a, b;* Soc. Myc. Fr. Bul. **5**: *pl. 7. f. 11.*—See Saccardo, Syll. Fung. **20**: 945 for references to some additional illustrations which I have not seen.

Type: authentic specimens of *Thelephora incrustans* and *Merisma cristatum* from Persoon in Kew Herb.

Fructifications coriaceous-fleshy, varied in form, creeping on the ground and ascending and incrusting small erect objects and forming little columns and free branches, the apices somewhat awl-shaped or fringed, or effused and resupinate on bark, whitish, drying warm buff; structure in section, 250–400 μ thick, (1) with a broad layer of very loosely interwoven rather stiff hyphae, 2–2½ μ in diameter, which divide above into fine branches and form (2) a densely interwoven layer about 60–150 μ thick with the basidia in the upper 40–90 μ among the very fine (1½ μ in diameter), densely crowded, somewhat interwoven filaments from the subhymenium; basidia longitudinally septate, ovoid or pyriform, 12–20 × 9–14 μ; spores colorless, simple, even, flattened on one side or curved, 12–14 × 6–8 μ.

Fructifications 5–6 cm. long, 2–5 cm. wide, ascending objects 2–5 cm.; pileate flaps, when present, ½–1 cm. long.

On the ground in woods and incrusting objects, and resupinate on logs. Canada to Louisiana and westward to Missouri. June to October. Common.

S. incrustans is the common incrusting *Sebacina* of Eastern North America. It may usually be recognized at sight by coriaceous-fleshy consistency, occurrence on earth and running up and incrusting living objects, and pallid color. The thinner hymenial layer, paraphyses less rod-like in form, and finer and thinner-walled hyphae of layer next to the substratum afford structural characters separating specimens of this species from those of *S. chlorascens* and *S. Helvelloides.*

I exclude from the synonymy of *S. cristata, Clavaria laciniata* of Bulliard's 'Hist. Champ.' **1**: 208. *pl. 415. f. 1,* because in the absence of authentic specimens and observations in regard to spores and basidia, it is not certain that *C. laciniata* Bull. is *Merisma cristatum.* Bulliard's figures represent quite as well an incrusting European fungus communicated to me by Bresadola under the name *Thelephora fastidiosa* (Pers.) Fr., which has simple basidia and colorless echinulate spores. This species is the *Thelephora cristata*

of Patouillard's 'Tab. Anal. Fung.' No. 559, and *Cristella cristata* of his 'Essai Taxon. Hym.' *f. 28.* Patouillard notes that *Clavaria laciniata* is a synonym of the species which he figures. Because of the uncertainty as to whether figures of *Thelephora cristata* by European authors represent the true *Merisma* [*Sebacina*] *cristatum* Pers. or the echinulate-spored *T. fastidiosa* (Pers.), I have refrained from citing any illustrations except that of Persoon, of whose species I have studied an authentic specimen.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 513.

The specimen in Thuemen, Myc. Univ. 2009, under the name *Thelephora sebacea,* collected in France, is *Thelephora mollissima* Pers.

Europe: authentic specimens of *Thelephora incrustans* and *Merisma cristatum* from Persoon in Kew Herb.

Sweden: sterile specimen determined as *Thelephora cristata* by E. Fries (in Fries Herb.); Stockholm, *L. Romell, 54.*

Canada: *J. Macoun, 5, 10.*

Quebec: Hull, *J. Macoun, 203, 313.*

Ontario: near Ottawa, *J. Macoun, 40* (in Can. Geol. Surv. Herb.); London, *J. Dearness.*

Maine: Portage, *L. W. Riddle.*

New Hampshire: Shelburne, *W. G. Farlow* (in Farlow Herb.).

Vermont: Middlebury, *E. A. Burt,* two collections.

Massachusetts: Williamstown, *W. G. Farlow* (in Farlow Herb.).

New York: Hudson Falls, *S. H. Burnham, 2* (in Mo. Bot. Gard. Herb., 43995).

Pennsylvania: *Michener, 5821* (in Curtis Herb.); Trexlertown, *W. Herbst.*

District of Columbia: Rock Creek, *C. L. Shear, 793.*

North Carolina: Asheville, *H. C. Beardslee, 03126.*

South Carolina: *Ravenel, 1619* (in Curtis Herb.).

Louisiana: St. Martinville, *A. B. Langlois, F, 2015;* the same locality and collector, (3022 in Lloyd Herb.); Baton Rouge, *Edgerton & Humphrey, 667.*

Ohio: *A. P. Morgan* (in Lloyd Herb., 2655, 2656); Cincinnati,

C. G. Lloyd, 4198; Loveland, *D. L. James* (in U. S. Dept. Agr. Herb.).

Wisconsin: Blue Mounds, *E. T. and S. A. Harper, 864, 879, 880;* Madison, *W. Trelease* (in Mo. Bot. Gard. Herb., 5145, 44779); *C. J. Humphrey, 2146* (in Mo. Bot. Gard. Herb., 44784).

Illinois: Riverside, *E. T. and S. A. Harper, 698.*

Missouri: Creve Coeur, *E. A. Burt* (in Mo. Bot. Gard. Herb., 44763).

2. **S. deglubens** (Berk. & Curtis) Burt, n. comb.

Corticium deglubens Berk. & Curtis, Grevillea **1**: 166. 1873.

Type: type and cotype in Kew Herb. and Curtis Herb.

Fructification resupinate, effused, coriaceous, separable, white beneath, drying about cacao-brown, the margin very narrow, white, byssoid, soon detached; structure in section 250–300 μ thick, (1) with a very loosely interwoven layer 180–200 μ thick, having hyphae $1\frac{1}{2}$–2 μ in diameter which branch and form (2) a very densely interwoven layer 80 μ thick with the basidia in the upper 30 μ, not quite reaching to the surface, among the very fine, densely interwoven filaments from the subhymenium; basidia longitudinally septate, 15 $\times$ 10–12 μ; spores colorless, simple, even, flattened on one side, 6–7 $\times$ $4\frac{1}{2}$–5 μ.

On juniper, Alabama.

This fungus has the same type of structure which is found in resupinate specimens of *Sebacina incrustans.* It differs from the latter in having the hymenium darker, all the spores found in a sectional preparation a little smaller, and the hyphae of the layer next to the substratum a little smaller and more flaccid than those of *S. incrustans,* and the margin was described as soon detached. These differences may be merely the variation from specific type of a single collection, or they may be those of a subspecies of *S. incrustans* which has taken on the saprophytic life on dead wood, prevalent for most species of *Sebacina.* Until other collections, referable to *S. deglubens* are made, the former view appears the more probable.

Specimens examined:
Alabama: *Peters,* Curtis Herb., 4557, type (in Kew Herb.).

3. **S. chlorascens** Burt, n. sp. Plate 27, fig. 15.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructification coriaceous, drying cream-color with glaucous tint, effused, ascending and incrusting the mossy bases of trees and forming imbricated, free, pileate, sterile branches, the apices spiculose or fimbriate; hymenium gelatinous, drying vinaceous brown, occurring in somewhat scattered spots on the lower portions of the fructification; structure in section 800 μ thick, with (1) a broad, spongy layer next to the substratum of loosely interwoven, rather rigid, even-walled hyphae $2\frac{1}{2}$–3 μ in diameter, which bear (2) a sharply differentiated hymenial layer 140–240 μ thick, composed of rod-like paraphyses 2 μ in diameter, between which occur basidia throughout the outer 60 μ of the layer; basidia longitudinally septate, pyriform, 15–18×12 μ; spores simple, colorless, flattened on one side, 10–$10\frac{1}{2}$× 6–7 μ.

Fig. 1
S. chlorascens
Paraphyses,
basidium×540.

Ascending objects 2–4 cm., 1–2 cm. broad; free branches up to 5 mm. long.

On mossy bases of living trees. Florida. Autumn.

As shown by the figures in pl. 27, the pileate branches of *S. chlorascens* do not resemble those of *S. incrustans.* The structure in section is different in every detail from that of specimens of the latter species and approaches more closely that of *S. Helvelloides,* but the fructification is thinner than that of the latter, has smaller basidia and spores, and the basidia distributed from the surface to about 60 μ below the surface, and forms free pileate branches.

Specimens examined:
Florida: Cocoanut Grove, *R. Thaxter, 98,* type (in Mo. Bot. Gard. Herb., 43923, and in Farlow Herb.).

4. **S. Helvelloides** (Schw.) Burt, n. comb. Plate 27, fig. 14.

Thelephora Helvelloides Schweinitz, Naturforsch. Ges. Leipzig Schrift. **1**:108. 1822; Am. Phil. Soc. Trans. N. S. **4**: 168. 1834; Fries, Elenchus Fung. **1**:193. 1828; Epicr. 541. 1836–1838.—*Corticium Helvelloides* Massee, Linn. Soc. Bot. Jour. **27**:153. 1891.—*Corticium basale* Peck, N. Y. State Mus. Rept. **43**:69 (23). 1890.

Type: in Herb. Schw. and portions in Curtis Herb. and in Kew Herb.

Fructification coriaceous, spongy, effused, convex, closely adnate and incrusting, on ground in mosses and on bark at bases of living trees, at first whitish, drying honey-color to warm buff; structure in section, with (1) a very thick spongy layer next the substratum, of loosely interwoven, branched, rather rigid, even-walled, brownish hyphae, 3–3½ μ in diameter, which bear (2) a fertile layer 200–300 μ thick made up of great numbers of erect, straight, cylindric paraphyses 2 μ in diameter, between which occur the basidia at about 40–50 μ below the surface; basidia longitudinally septate, pyriform, 20–25 $\times$ 15 μ; spores colorless, simple, flattened or slightly curved on one side, 12–13 $\times$ 6 μ.

Fructifications 3–15 cm. long and wide, drying about ½–2 mm. thick to 9 mm. thick in type which covers a cushion of moss plants.

On ground and bark at bases of living trees. New York to North Carolina. July and August.

Specimens of this species have somewhat the habit of thick specimens of *Coniophora puteana* but are of very different structure. The abundant, erect, unbranched, cylindric paraphyses often 200 μ long which compose the greater part of the hymenium, and the large basidia are reliable characters for identifying *Sebacina Helvelloides* when sections are studied; the coarser and colored hyphae of the species give an additional character separating it from *S. incrustans* when the latter occurs strictly resupinate.

The type specimen is abnormal in thickness and ridged surface by running over and incrusting a bed of moss. The hanging rootlets referred to in the original description are

moss stems. The specific name is rather fanciful and misleading.

Specimens examined:

New York: Whitehall, *C. H. Peck,* type of *Corticium basale* (in Coll. N. Y. State); Alcove, *C. L. Shear, 1221.*

North Carolina: Salem, *Schweinitz,* type (in Herb. Schw., in Curtis Herb., and in Kew Herb.).

5. **S. Shearii** Burt, n. sp. Plate 27, fig. 16.

Type: in Burt. Herb., and in Shear Herb.

Fructification coriaceous, effused, dull white, drying pale olive-buff, cracked, the margin determinate, entire; structure in section, 140–200 μ thick, with (1) a broad and dense layer next to the substratum of longitudinally arranged, slightly brownish, even-walled hyphae 1½–2 μ in diameter, which branch and curve outward at a right angle and form (2) a fertile, less compact layer 60–75 μ thick of suberect, few-branched paraphyses 3 μ in diameter, of basidia at about 15–20 μ below the surface, and of scattered, even-walled, flexuous, cylindric-clavate organs—perhaps gloeocystidia—40–45 × 6 μ, not emergent above the surface; basidia longitudinally septate, pyriform, 15 × 9 μ, with sterigmata 18 × 3 μ; spores colorless, simple, curved, 9–15 × 4½–6 μ.

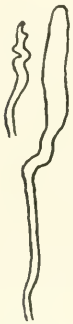


Fig. 2 S. Shearii. Paraphysis at left, organ×540.

Fructifications in crevices of bark at first, 2 × 1 mm., at length, by confluence, 7 cm. long, 1 cm. broad.

On dead *Berberis vulgaris.* District of Columbia. October.

This species is well characterized by the presence in the hymenial layer of flexuous, even-walled organs, which are either latex or gloeocystidia, and by the broad layer of longitudinally arranged hyphae which shows relationship to *Eichleriella,* although the margin is not distinctly free. A few small granules are present on the hymenial surface but I do not know that they are a constant character.

Specimens examined:

District of Columbia: grounds U. S. Dept. Agr., Washington, *C. L. Shear, 1238,* type.

6. S. macrospora (E. & E.) Burt, n. comb.

Corticium macrosporum Ell. & Ev., Torr. Bot. Club Bul. **27**: 49. 1900.

Type: in N. Y. Bot. Gard. Herb.; specimens from type collection in Lloyd Herb., and in Burt Herb.

Fructification coriaceous, appressed, thin, dull white, cracked, the narrow, white, cottony margin sometimes narrowly involute; structure in section, 300–400 μ thick, with (1) a very broad layer of longitudinally arranged and somewhat obliquely ascending crowded hyphae $1\frac{1}{2}$ μ in diameter, colorless next to substratum but brownish in upper part of layer, which pass into (2) the hymenial layer 60–100 μ thick, consisting of erect, bushy paraphyses and of basidia; basidia longitudinally septate, pyriform to subglobose, 15×9–12 μ; spores colorless, simple, flattened on one side or curved, $10\frac{1}{2} \times 4\frac{1}{2}$–$6$ μ.

Appearing at first in orbicular patches 3–5 mm. in diameter, at length confluent and up to 4 cm. long, $1\frac{1}{2}$ cm. broad.

On pine (*Pinus Strobus*) limbs. Ohio. September.

This species is near *Sebacina calcea,* but the single collection which has been studied seems distinct from the latter by the thick, determinate margin, sometimes free and slightly upturned, by the greater thickness of the fructifications, by the brown hyphae of the middle region, and by walls of hyphae not gelatinously modified as in *S. calcea.* A relationship to *Eichleriella* is manifest in the broad layer of longitudinally arranged hyphae and in the tendency of the margin to be slightly free. The original description gives this species as on *"Fraxinus?",* but the limbs are *Pinus strobus.* The spores are not exceptionally large; the specific name was probably based on immature basidia.

Specimens examined.

Ohio: Linwood, *C. G. Lloyd, 3113,* type collection.

7. S. calcea (Pers.) Bresadola, Fungi Tridentini **2**: 64. *pl. 175.* 1892. Plate 27, fig. 17.

Thelephora calcea Persoon, Syn. Fung. 581. 1801; Myc. Eur. **1**: 153. 1822.—*Thelephora calcea c. albido-fuscescens*

Fries, Elenchus Fung. 1:215. 1828.—*Thelephora acerina* forma *Abietis* Fries, Syst. Myc. 1:453. 1821.—*Corticium Abietis* (Fr.) Romell, Bot. Not. **1895**:72. 1895.—*Xerocarpus farinellus* Karsten, Finska Vet.-Soc. Bidrag **37**:139. 1882.

Illustrations: Bresadola, *loc. cit.;* Patouillard, Essai Taxon. Hym. 25. *f. 17b.*

Fructification effused, closely adnate, crustaceous, slightly pulverulent, shining white at first, at length darkening in the central portion from cartridge-buff to pale drab-gray, cracked, the margin much thinner and farinaceous; structure in section, 50–150 μ thick, (1) with hyphae next the substratum interwoven, 2 μ thick, the wall gelatinously modified, (2) hymenial layer 40–60 μ thick, composed of basidia and of paraphyses branched at the apex into very fine branches loaded with minute granules; basidia more abundant in the lower portion of the hymenial layer, longitudinally septate, 14×9 μ; spores colorless, simple, cylindric, curved, $8–12 \times 4–5$ μ.

Fig. 3
S. calcea.
Paraphyses×540.

Fructifications 3–9 cm. long, 1–3 cm. broad.

On bark and wood of dead branches of spruce, pine, hemlock, white cedar, oak, ash, elm, maple, and elder. Canada, northern New England, and New York to Georgia, and in Washington. March to January—perhaps throughout the year.

As good distinctive macroscopic characters this species has: chalky white color with central portions ashy; powdery surface under a lens; thinness on drying and margin still thinner, so that it appears mealy under a lens rather than membranous. The fine branches and granules at the tips of the paraphyses show best in lactic acid preparations; potassium hydrate solution has a solvent action here. I have not been able to study an authentic specimen of *Thelephora calcea* Pers. and accept Bresadola's conclusion on this point.

Specimens examined:

Exsiccati: Romell, Fungi Exs. Scand. 129.

Austria: *G. Bresadola.*

Sweden: *L. Romell, 58, 59;* Stockholm, *L. Romell,* Fungi Exs.

Scand. These specimens are under the name *Corticium Abietis.*

Norway: Christiania, *M. N. Blytt* (in Herb. Fries and determined by Fries as *Corticium calceum*).

Finland: Mustiala, *P. A. Karsten,* under the name *Xerocarpus farinellus.*

Canada: *J. Macoun, 30, 33.*

New Hampshire: Chocorua, *W. G. Farlow,* two collections.

Vermont: Middlebury, *E. A. Burt,* two collections; Ripton, *E. A. Burt;* Little Notch, Bristol, *E. A. Burt.*

New York: Alcove, *C. L. Shear, 1134, 1208;* Hague, *C. H. Peck, 10;* Clear Water, *G. F. Atkinson,* Cornell Univ. Herb., 5049.

Georgia: Tipton, *C. J. Humphrey, 177;* Savannah, *C. J. Humphrey, 5106* (in Mo. Bot. Gard. Herb., 15081).

Washington: Bingen, *W. N. Suksdorf, 695, 711, 763, 765, 864.*

8. **S. monticola** Burt, n. sp.

Type: in Mo. Bot. Gard. Herb.

Fructification coriaceous, resupinate, cracked, dirty whitish approaching pale smoke-gray, the margin closely adnate; structure in section 200–300 μ thick, with hyphae colorless, 3–4 μ in diameter, ascending obliquely from substratum to surface, densely crowded together, more interwoven and little incrusted in the lower third of the fructification, but more loosely arranged and heavily incrusted in the whole upper two-thirds, terminating in incrusted paraphyses which are either simple or 2–4-branched and with the hyphal body about $2\frac{1}{2}$ μ in diameter under the incrustation; basidia about 40 μ below the surface of the hymenium, longitudinally septate, 15–20 $\times$ 9–12 μ; spores simple, colorless, even, cylindric, straight or curved, 9–$10\frac{1}{2}$ $\times$ 5–$5\frac{1}{2}$ μ.

The portion of the fructification described is 5 cm. long, about $1\frac{1}{2}$ cm. wide.

On bark of log of *Picea Engelmanni,* altitude 8,500 ft., Pike's Peak, Colorado. August.

This species belongs in the group with *Sebacina calcea* and *S. macrospora;* it is distinguished from both of these by the

incrustation of its hyphae and by simpler paraphyses, which are either unbranched or with only about 2–4 branches not branching repeatedly and becoming so attenuated as to be nearly invisible except for the granules which they bear.

Specimens examined:

Colorado: Pike's Peak, *G. G. Hedgcock,* comm. by C. J. Humphrey, 2571, type (in Mo. Bot. Gard. Herb., 15157).

9. **S. scariosa** (Berk. & Curtis) Burt, n. comb.

Corticium scariosum Berk. & Curtis, Grevillea **2**: 3. July, 1873.—*Corticium secedens* Saccardo, Syll. Fung. **6**: 635. 1888.

Type: type and cotype in Kew Herb. and Curtis Herb., respectively.

"Forming a thin, oblong, membranous stratum, without any distinct border; hymenium pulverulent ochroleucous."

—Original description.

Structure in section 300–600 μ thick, with hyphae 2 μ in diameter, branched, very loosely interwoven, extending from substratum to basidia, with walls gelatinously modified, imbedded in jelly, much crystalline matter about 90–120 μ below the hymenial surface; basidia at or near the surface, longitudinally septate, pyriform to subglobose, 12–15 $\times$ 9–12 μ; no spores found.

On alder, South Carolina.

The type specimens of this species have the general habit of *Peniophora gigantea,* which they also resemble in being separable and in cracking and peeling up from the substratum, but they are more lemon-yellow in color than specimens of the latter species. The structure in section is distinctive and suggestive of that of *Eichleriella alliciens.* Authors have sometimes confused *Corticium scariosum* B. & C. with *Corticium scariosum* B. and Br., published from Ceylon a few months later in the same year. The types of these fungi are not of the same genus, the American specimens having longitudinally septate basidia.

Specimens examined:

South Carolina: Society Hill, *M. A. Curtis, 4916* (type and cotype in Kew Herb. and Curtis Herb.).

10. S. podlachica Bresadola, Ann. Myc. **1**: 117. 1903.

Type: in Bresadola Herb. and a portion in Burt Herb.

Fructification effused, closely adnate, described as "e pallido-caerulea caesio-hyalina," drying tawny olive to Saccardo's umber where directly on the wood; structure in section 30–45 μ thick, with hyphae 2 μ in diameter closely crowded together and rising obliquely from substratum to the surface; basidia in upper 15 μ of fructification among the hyphal filaments, longitudinally septate, pyriform, 7–10 $\times$ 6–8 μ; spores colorless, simple, even, curved, 6–7 $\times$ 3–5 μ.

Covering areas 5 cm. long, 2 cm. broad.

On decaying coniferous wood, Massachusetts; on decaying beech wood, Russian Poland.

The Massachusetts collection was noted as blue-purple when fresh; in some places algae coating the wood have been covered by the fructification and the modified color of this algal layer is seen through the dried fructification; where the fungus coats the wood directly, the color of specimens which have been several years in the herbarium is the tawny olive. The American collection agrees closely with that communicated by Bresadola.

Specimens examined:

Russian Poland: on beech wood, *Eichler,* comm. by Bresadola, part of type.

Massachusetts: on coniferous wood, *W. G. Farlow.*

11. S. cinnamomea Burt, n. sp. Plate 27, fig. 18.

Type: in Burt Herb.

Fructification effused, coriaceous, dry, closely adnate, drying cinnamon-brown, the margin determinate, thick, entire; structure in section 100–140 μ thick, with (1) a layer 10–30 μ thick next to the substratum of longitudinally arranged, densely interwoven hyphae 2–2½ μ in diameter, which bear (2) the hymenial layer composed of basidia at the lower side of the layer, and of loosely arranged, highly branched, bush-

Fig. 4
S. cinnamomea.
Paraphysis $\times$540.

shaped paraphyses with brown branches of zigzag form, which rise 45–60 μ above the basidia and give the characteristic color of the hymenium; basidia 15–20 × 9–11 μ, longitudinal septation not positively made out; no spores found; paraphyses 75 μ long, trunk 1½–2 μ in diameter, sweep of branched top about 20 μ.

Fructification 4 cm. long, 1 cm. broad.

On limbs of dead *Magnolia glauca.* Maryland. December.

It is not certain that this fungus is a *Sebacina,* for none of its basidium-like organs show longitudinal septa, although in a very few there is arrangement of the protoplasm suggestive of such septation. The specimen is a little too immature for generic reference but is probably a young *Sebacina* in my opinion. The species is distinct from others in possible genera by cinnamon-brown color, paraphyses scattered as to trunks but with such brown, bushy-branched tops as to form a compact surface of the color stated.

Specimens examined:

Maryland: Takoma Park, *C. L. Shear, 1339,* type.

12. S. adusta Burt, n. sp. Plate 27, fig. 19.

Type: in Burt Herb.

Fructification broadly effused, coriaceous, separable from the substratum, Hay's brown when moist, drying fuscous, the margin pale cartridge-buff, fibrillose-fimbriate; structure in section, 500–600 μ thick, composed of densely interwoven and obliquely ascending hyphae 3 μ in diameter, the walls not gelatinously modified, which bear the basidia at the surface of the hymenium; basidia longitudinally septate, pyriform, 12–16 × 8–10 μ; spores colorless, simple, curved, 10–12 × 4–5 μ.

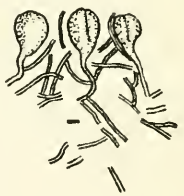


Fig. 5
S. adusta.
Basidia and
hyphae×540.

Fructification 12 cm. long, 4 cm. broad.

On decorticated trunk of *Populus trichocarpa.* Idaho. July to September.

In the single collection of this species which has been received the margin is everywhere closely applied to the substratum and shows no tendency towards becoming free or

reflexed, hence the species must be included in *Sebacina*. The distinguishing specific characters are easy separation as an unbroken membrane of the moist fructification from the substratum, thickness of fructification, and position of the basidia at the surface of the hymenium.

Specimens examined:

Idaho: Kaniksu National Forest, Priest River, *J. R. Weir, 12,* type.

13. S. plumbea Burt, n. sp. Plate 27, fig. 20.

Type: in Burt Herb.

Fructification effused, closely adnate, drying blackish plumbeous, pruinose, the margin indeterminate; structure in section, 150–200 μ thick, with (1) a broad layer next to the substratum containing much crystalline matter in the interspaces between the interwoven suberect hyphae $1\frac{1}{2}$–2 μ in diameter, the wall gelatinously modified, and (2) a hymenial layer about 60 μ thick consisting of basidia, and of hyphae which branch and form a densely interwoven hymenial surface; basidia about 30 μ below the surface of hymenium, longitudinally septate, pyriform, 15–18 $\times$ 10–13 μ; spores colorless, simple, even, curved, 13–15 $\times$ $4\frac{1}{2}$–6 μ.

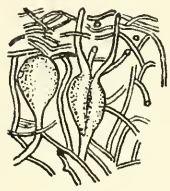


Fig. 6
S. plumbea. Basidia and hyphae×540.

Fructification 4–8 cm. long, $\frac{1}{2}$–1 cm. broad.

On blackened wood of *Populus trichocarpa.* Washington. November.

The coloration and habit of specimens of this species agree closely with those of the European *Corticium plumbeum* Fr. which have been received from Karsten, but the internal structure is wholly different from that of the latter.

Specimens examined:

Washington: Bingen, *W. N. Suksdorf, 862,* type.

14. S. atrata Burt, n. sp. Plate 27, fig. 21.

Type: in Burt Herb. and in Farlow Herb.

Fructification effused, somewhat gelatinous, closely adnate, grayish when moist, drying dark mouse-gray and shining, the margin thinning out and indeterminate; structure in section,

50–160 μ thick, with even-walled hyphae 3 μ in diameter, densely interwoven next to the substratum, then curving outward to form a hymenial layer 50–90 μ thick, consisting of erect, parallel, rod-like paraphyses 2 μ in diameter and of basidia about 30 μ below the surface of the hymenium; basidia longitudinally septate, pyriform, about 18 × 12 μ; spores colorless, simple, somewhat flattened on one side, 8–10 × 6–7 μ.

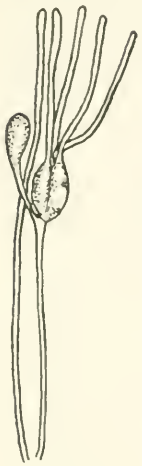


Fig. 7
S. atrata.
Paraphysis,
basidia × 540.

Fructifications 2½ cm. long, 1½ cm. broad.

On very rotten coniferous and frondose wood. New Hampshire and Massachusetts. May.

When bits of dried specimens of this species are moistened, they become softer and more gelatinous than is usual with those of other species of the genus, but walls of the hyphae do not show gelatinous modification in sectional preparations. The paraphyses are as noteworthy as those of *Sebacina Helvelloides,* being arranged close together side by side in a palisade layer. They are sometimes simple rods, sometimes divided into equal branches which rise side by side to the surface of the hymenium.

Specimens examined:

New Hampshire: Chocorua, *W. G. Farlow,* two collections (of which No. *a* is in Mo. Bot. Gard. Herb., 44782).

Massachusetts: Magnolia, *W. G. Farlow,* type.

(To be continued.)

Explanation of Plate

PLATE 26

The figures of this plate have been reproduced natural size from photographs of dried herbarium specimens.

Fig. 1. *Tremellodendron Cladonia.* *a*, from specimen collected in Canada by J. Macoun, 78; *b*, collected at Hague, New York, by C. H. Peck, 7; *c*, collected at Cincinnati, Ohio, by A. P. Morgan, Lloyd Herb., 32.

Fig. 2. *T. Cladonia*, from the type of *Thelephora gracilis*, collected in Alabama by F. S. Earle, 13.

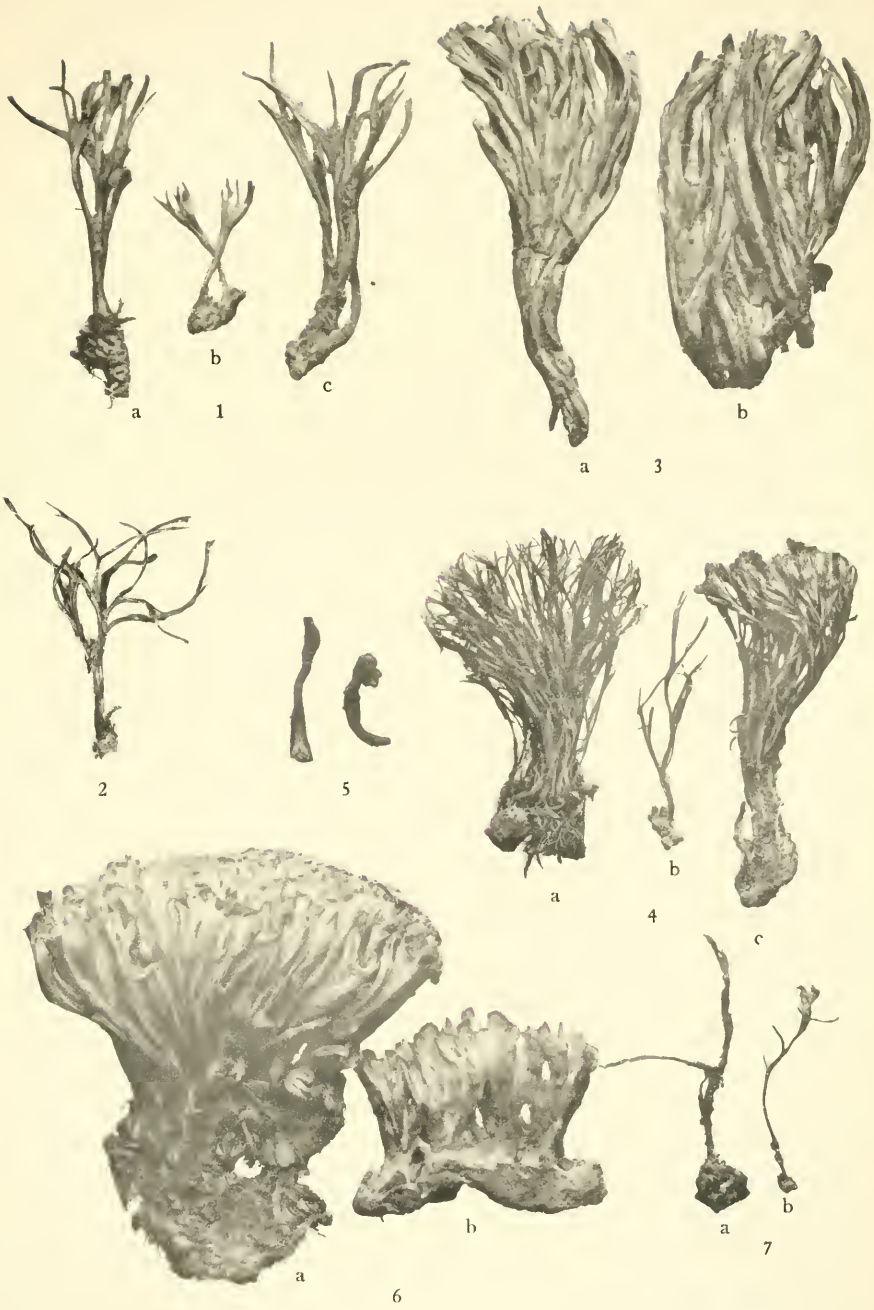
Fig. 3. *T. candidum.* Collected at Newfane, Vermont, by C. D. Howe. *a* agrees closely with the type and is my standard for comparison; *b* could be separated without fracture into three portions, each having form of *a*.

Fig. 4. *T. merismatoides.* *a*, from specimen collected at York County, Pennsylvania, by N. M. Glatfelter; *b*, single fructification from the cluster *a*; *c*, from a very fasciculate specimen having stems grown together and branches still fimbriate at apex, collected at Haddonfield, New Jersey, by T. J. Collins.

Fig. 5. *T. simplex.* From type collected in Porto Rico, by J. R. Johnston. The fructification on the right is inverted.

Fig. 6. *T. pallidum.* *a*, from specimen collected at Middlebury, Vermont, by E. A. Burt; *b*, from specimen in Mo. Bot. Gard. Herb., 712370, collected at St. Louis, Missouri, by N. M. Glatfelter. Both show the growth together of the flattened pileate divisions.

Fig. 7. *T. tenue.* *a*, from type, collected at Chester Vale, Jamaica, by W. A. and E. L. Murrill, 400; *b*, from specimens collected at Cinchona, Jamaica, by the same collectors, 614.



BURT—THELEPHORACEAE OF NORTH AMERICA

1 AND 2. TREMELLODENDRON CLADONIA.—3. T. CANDIDUM.—4. T. MERISMATOIDES.—5. T. SIMPLEX.—6. T. PALLIDUM.—7. T. TENUE.

Explanation of Plate

PLATE 27

The figures of this plate have been reproduced natural size from photographs of dried herbarium specimens, except in the cases noted otherwise.

Fig. 8. *Eichleriella Schrenkii.* From the type collected at San Antonio, Texas, by H. von Schrenk. *a*, photograph of a piece of limb bearing many fructifications, and *b*, drawing of median longitudinal section of single fructification, × 16.

Fig. 9. *E. Leveilliana.* From specimens collected at San Antonio, Texas, by H. von Schrenk.

Fig. 10. *E. alliciens.* From specimen collected at San Diego de los Baños, Cuba, by Earle and Murrill, 405, in part.

Fig. 11. *E. spinulosa.* From specimen collected at Priest River, Idaho, by J. R. Weir, 55.

Fig. 12. *E. gelatinosa.* From specimens collected in Jamaica by W. A. Murrill and W. Harris. *a*, upper surface of No. 180; *b*, type specimen, 1087, split longitudinally to show thickness of pileus and structure.

Fig. 13. *Sebacina incrustans.* *a*, from specimen collected at Middlebury, Vermont, by E. A. Burt; *b*, from specimen with pileate flaps, collected at Asheville, North Carolina, by H. C. Beardslee, 03126.

Fig. 14. *S. Helvelloides.* From specimen collected at Alcove, New York, by C. L. Shear, 1221. *a* shows upper surface; *b* is a vertical section from the same fructification to show thickness.

Fig. 15. *S. chlorascens.* From type specimen collected at Cocoanut Grove, Florida, by R. Thaxter, 98.

Fig. 16. *S. Shearii.* From type specimens collected at Washington, District of Columbia, by C. L. Shear, 1238.

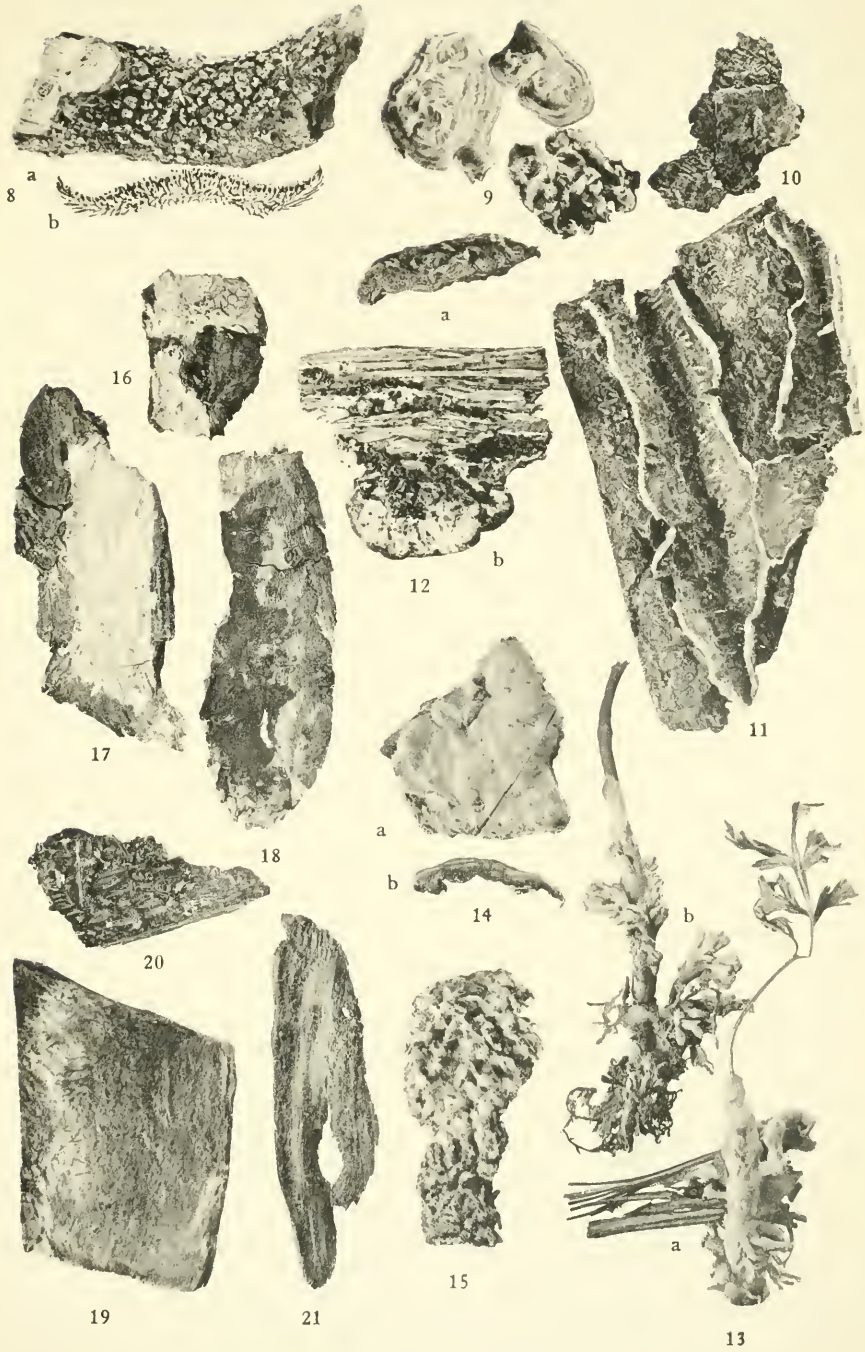
Fig. 17. *S. calcea.* From specimen on white cedar bark, collected at Middlebury, Vermont, by E. A. Burt.

Fig. 18. *S. cinnamomea.* From type specimen collected at Takoma Park, Maryland, by C. L. Shear, 1339.

Fig. 19. *S. adusta.* From type specimen collected at Priest River, Idaho, by J. R. Weir, 12.

Fig. 20. *S. plumbea.* From type specimen collected at Bingen, Washington, by W. N. Suksdorf, 862.

Fig. 21. *S. atrata.* From specimen collected at Chocorua, New Hampshire, by W. G. Farlow.



BURT—THELEPHORACEAE OF NORTH AMERICA

8. EICHLERIELLA SCHRENKII.—9. E. LEVEILLIANA.—10. E. ALLICIENS.—11. E. SPINULOSA.—12. E. GELATINOSA.—13. SEBACINA INCRUSTANS.—14. S. HELVELLOIDES.—15. S. CHLORASCENS.—16. S. SHEARII.—17. S. CALCEA.—18. S. CINNAMOMEA.—19. S. ADUSTA.—20. S. PLUMBEA.—21. S. ATRATA.

The Thelephoraceae of North America. VI

Hypochnus

EDWARD ANGUS BURT

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THE THELEPHORACEAE OF NORTH AMERICA VI[1]

Hypochnus

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HYPOCHNUS

Hypochnus Fries emend. Karsten, Rev. Myc. **3**[9]:23. 1881; Finska Vetenskaps-Soc. Bidrag Natur och Folk **37**:162. 1882; Finl. Basidsv. 438. 1889; Fries, Obs. Myc. **2**:278. 1818 and 1824, (in part); Syst. Myc. **3**:289. 1829, (in part); Gen. Hym. 16. 1836, (in part); Epicr. 569. 1838, (in part); Sacc. Syll. Fung. **6**:653. 1888, (in part); R. Fries, R. Sci. Soc. Gothoburgens Actis IV. **3**:37. 1900. — *Hypochnus* as a subgenus of *Corticium* Fries, Hym. Eur. 659. 1874, (in part). — *Tomentella* Persoon ex Patouillard,[2] Hym. Eur. 154. 1887; Schroeter,[2] Krypt.-Fl. Schlesien **3**:419. 1888; Engl. & Prantl, Nat. Pflanzenfam. (**I**:1**):117. 1898. — *Tomentellina* v. Höhnel & Litschauer, K. Akad. Wiss. Wien Sitzungsber. **115**: 1604. 1906.

Fructifications resupinate, effused, dry, coriaceous, felt-like or hypochnoid, usually composed of loosely interwoven hyphae which bear basidia sometimes in scattered clusters but more usually in a compact hymenium; hymenium even or papillose; basidia simple, bearing two or more spores, rough-walled to echinulate, distinctly colored in most species, pale-colored in a few, and hyaline in one or possibly more species.

[1]Issued September 30, 1916.

[2]Patouillard and Schroeter, in the works cited above, attributed *Tomentella* to Persoon, because he used this word in parenthesis in the names of two species in his published note-book, Obs. Myc. 2:18 and 19, 1799, as follows:

"27. Corticium (Tomentella) ferrugineum.
"28. Corticium (Tomentella) chalibeum."

This is not generic publication of Tomentella. Why Persoon used the word is not evident; he did not adopt it as a genus in his following formal taxonomic works: 'Synopsis Fungorum' published in 1801, and 'Mycologia Europaea,' in 1822. Generic publication of *Tomentella* was not made until 1887 by Patouillard six years after Karsten's emendation of Hypochnus; hence *Tomentella* is a synonym of *Hypochnus*.

Hypochnus is separated from *Thelephora,* as I have limited the latter, by strictly resupinate habit; from *Corticium* and *Peniophora* by rough-walled to echinulate spores which are usually, but not always, distinctly colored; from *Zygodesmus* of the *Hyphomycetes* by true basidia which bear two or more spores; and from *Grandinia* and *Odontia* of the *Hydnaceae* by loosely interwoven, hypochnoid structure and more or less colored, rough-walled to echinulate spores.

As here treated, the species of *Hypochnus* form a natural, compact group at the foot of *Hymenomycetes,* with simple basidia, and closely resembling *Zygodesmus* in general habit and also in form and color of spores. *Hypochnus* is so closely related to *Thelephora* and *Grandinia* that many of its species have been published in those genera, as will be seen by the synonymy of species, or occur in those genera under manuscript names in the large herbaria.

The species of *Hypochnus* are apparently humus formers, for the fructifications are found under very rotten wood and other organic matter rather than on nearly sound wood. Hence they probably follow other fungi in wood destruction.

This is the first presentation of the North American species of *Hypochnus.* It shows the geographical distribution of the genus localized in the northeastern United States and along our Atlantic coast and ranging westward across the northern United States. Not an *Hypochnus* has been found in a series of 175 numbers of *Thelephoraceae,* mostly resupinate, collected by Dr. and Mrs. Murrill in Mexico.

The sketches of microscopic details of the species in this part were made by the aid of a camera lucida from preparations of such type or authentic specimens as are referred to in the accompanying text.

The development of the present conception of *Hypochnus* is of historical interest. When first published, *Hypochnus* comprised species which I refer to *Hypochnus* and *Corticium;* then tropical lichens predominated; in his last work Fries excluded the lichens, recognized the close relationship to *Corticium* and placed both *Coniophora* and *Hypochnus* as

subgenera of *Corticium*. As several species of *Corticium* were still included in *Hypochnus*, Fries had good reason for regarding *Hypochnus* in his sense as closely related to *Corticium*. Karsten's emendation of *Hypochnus* a few years later was logical, and in sympathy with the work of Fries, for it retained this name for the greatest number of cogeneric species both originally published in the genus and retained in the final work of Fries. These species are furthermore the only species for which the generic name *Hypochnus* can be retained, for the other species of the subgenus in Fries' 'Hymenomycetes Europeae' revert to *Corticium* under modern study.

Hypochnus, as presented in Saccardo's 'Sylloge Fungorum,' is an aggregation of species of several genera and includes also the tropical lichens which Fries excluded from the genus in 1874. *Hypochnus* as given in Engler & Prantl's 'Die Natürlichen Pflanzenfamilien,' is the presentation of a purely academic scheme of Schroeter's as to how the lower *Hymenomycetes* ought to be classified to have a family *Hypochnacei*, but the fungi do not fall in with the scheme. They cannot be separated from *Corticium* and *Peniophora*. Von Höhnel and P. Sydow have pointed out [1] that *Hypochnus* in the sense of Schroeter must be abandoned as a genus and its species take their proper places in other genera. It is to be regretted that Saccardo's 'Sylloge Fungorum' and Engler & Prantl's 'Die Natürlichen Pflanzenfamilien' give a false lead with regard to *Hypochnus*, for these works are the main reliance of plant pathologists in the matter of genera.

Key to the Species

Spores distinctly colored as seen with the microscope 1
Spores so pale yellowish or hyaline as to appear hyaline or nearly so under the microscope..... 16

1. Fructification "ferruginous," i. e., Sudan-brown,* Brussels-brown, and hazel of Ridgway; spores concolorous with the fructification, but wax-yellow under the microscope..... 2

[1] Ann. Myc. 4:551. 1906. See also von Höhnel & Litschauer, Ann. Myc. 4:288. 1906.

*The technical color terms used in this work are those of Ridgway, Color Standards and Nomenclature. Washington, D. C., 1912.

1. Fructification not "ferruginous"; spores not wax-yellow under the microscope 4
2. Without cystidia 3
2. With cystidia consisting of non-incrusted, cylindric organs protruding from the hymenium ..... *4. H. canadensis*
3. Fructification adnate; all hyphae colored like the spores; spores echinulate ..... *1. H. ferrugineus*
3. Fructification separable from substratum; all hyphae colored like the spores; spores aculeate ..... *2. H. rubiginosus*
3. Fructification separable; hyphae dark-colored next to substratum; subhymenial hyphae colored like the spores; spores echinulate *3. H. subferrugineus*
4. Hyphae not nodose-septate, i. e., not having clamp connections 5
4. Hyphae nodose-septate, i. e., with clamp connections 6
5. Fructification ranging from drab to fuscous and Chaetura-drab, separable; spores and hyphae concolorous, dark olive-buff to buffy brown under the microscope; hyphae 4–5μ in diameter; spores aculeate or coarsely tuberculate ..... *5. H. umbrinus*
5. Fructification vinaceous-brown becoming Rood's brown, adnate; hyphae colored next to substratum, hyaline in subhymenium, 4–5μ in diameter; spores umber, aculeate, the body 5–6μ in diameter or 5–6×4–5μ ..... *21. H. subvinosus*
5. Fructification deep olive-buff to dark olive-buff, adnate; spores and hyphae concolorous; hyphae near the substratum 8–10μ, or more, in diameter; spores echinulate, the body 7–9μ in diameter ..... *12. H. isabellinus*
6. Without cystidia 7
6. With cystidia consisting of non-incrusted cylindric organs protruding from the hymenium ..... *11. H. pilosus*
7. Margin of the same color as the hymenial surface 8
7. Margin of different color from the hymenial surface 12
8. Fructification dark-colored — cinnamon-drab, umber, sepia, fuscous — and the hyphae concolorous 9
8. Fructification sepia or citrine, and the hyphae yellowish or hyaline under the microscope after treatment with KHO solution 10
8. Fructification varying in brown from Saccardo's umber and snuff-brown to cinnamon-brown; hyphae and spores concolorous with the fructification; spores echinulate, the body 6–8×5–7μ ..... *13. H. pannosus*
8. Fructification between cartridge-buff and olive-buff; hyphae and spores snuff-brown under the microscope; known from Washington only ..... *14. H. avellaneus*
8. Fructification drab or gray, and the hyphae hyaline under the microscope 11
9. Fructification with a distinct vinaceous tinge, 250–350μ thick; hyphae suberect, not rough-walled, often collapsed, rather paler than the spores under the microscope; spores aculeate or echinulate ..... *6. H. fuscus*
9. Fructification varying from Saccardo's umber to bister, rarely fuscous, 200–1200μ thick; hyphae thick-walled, not rough-walled, extending in all directions in the subiculum and loosely interwoven; spores echinulate ..... *7. H. spongiosus*
9. Resembling *H. spongiosus* but many hyphae have the wall minutely spinulose or rough; known from New Hampshire and Massachusetts ..... *8. H. spiniferus*
10. Fructification sepia, separable, 200–400μ thick; hyphae thin-walled, loosely interwoven, 2½–4μ in diameter, with some rope-like strands next to substratum; no noteworthy color change caused in sections by KHO solution ..... *9. H. granulosus*
10. Fructification citrine, adnate, the color destroyed and dissolved by KHO solution which becomes colored brownish; hyphae thin-walled, 5–6μ in diameter ..... *10. H. olivascens*
11. Fructification byssoid, drab, adnate, 60–75μ thick; hyphae short-celled, irregular in form and diameter, 4–6μ in diameter; spores grayish olive under the microscope, echinulate; known from New Hampshire ..... *15. H. sparsus*

11. Fructification felty-membranaceous, light mineral-gray, 400μ thick, two-layered; hyphae 4μ in diameter; spores deep olive-buff to hyaline under the microscope, rough-walled or aculeate with very short points; on ground in Massachusetts.....*16. H. epigaeus*
12. Fructification separable from substratum when moistened..... 13
12. Fructification adnate, fawn-color, under side and margin whitish; hyphae suberect, thin-walled, 2½–3μ in diameter, hyaline under the microscope; known from Washington.....*22. H. ccrvinus*
13. KHO solution causes a color change when added to sections immersed in a drop of water in making preparations..... 14
13. KHO solution causes no noteworthy color change..... 15
14. A change of color to between blue-green and sage-green is caused in the granules; fructification Chaetura-drab to fuscous, granular, the margin much paler, brownish and floccose; hyphae somewhat colored, 3–4μ in diameter.....*17. H. botryoides*
14. A change of color to sage-green is caused in the hymenium; fructification brownish olive, granular, the margin ochraceous-tawny; hyphae somewhat colored, only occasionally nodose-septate, 2½–3½μ in diameter, forming occasional rope-like strands next to substratum. .....*18. H. coriarius*
14. Original colors are destroyed and the hyphae become sage-green; fructification olive-ocher at surface, with under side and margin brownish drab; hyphae 3μ in diameter, with some rope-like hyphal strands next to substratum.....*19. H. bicolor*
15. Fructification between walnut-brown and Vandyke-brown (a "dark red") and the margin Isabella-color or melleus; hyphae colored, 5–6μ in diameter, with rope-like strands next the substratum .....*20. H. atroruber*
15. Fructification with upper side pinkish buff to Isabella-color, the under side and margin bister; hyphae, 5–7μ in diameter, run along the substratum and give off suberect, interwoven, colored branches 3½–4½μ in diameter — no rope-like strands .....*23. H. fuligineus*
15. Fructification drab-gray, the margin whitish; hyphae hyaline under the microscope .....*24. H. cinerascens*
16. Hyphae not nodose-septate, i. e., not having clamp connections 17
16. Hyphae nodose-septate..... 18
17. With cystidia; fructification pinkish buff, adnate .....*25. H. peniophoroides*
17. Without cystidia; fructification becoming warm buff, thick, and firm, like *Corticium portentosum;* hyphae 2μ in diameter, terminating in the hymenium in dichotomously branched, antler-shaped organs; basidiospores hyaline or nearly so; even spores, colored like the hyphae, abundant between the hyphae.....*26. H. thelephoroides*
17. Without cystidia; fructification pinkish buff to cinnamon-buff and avellaneous; hyphae 3½–5μ in diameter, forming some rope-like strands next to substratum; spores with a slight tinge of buff in collection on slide but hyaline under the microscope, echinulate, the body 5–6×4–4½μ. .....*27. H. zygodesmoides*
17. Without cystidia; fructification Naples-yellow to deep colonial buff; hyphae 3–4μ in diameter, not forming rope-like strands; spores concolorous but sometimes hyaline under the microscope, echinulate, the body 4–5μ in diameter .....*28. H. echinosporus*
18. Fructification between olive-buff and deep olive-buff; spores concolorous, very pale under the microscope.....*29. H. fibrillosus*
18. Fructification honey-yellow to drab and fuscous, the margin whitish or yellowish, flaxy-fibrillose, radiating; spores white in collection on slide, minutely echinulate with short, crowded spines, body 3–5×2½–3½μ.....*30. H. fumosus*

1. Hypochnus ferrugineus Pers. ex Fries, Obs. Myc. **2**:280. 1818 and 1824; Karsten, Finska Vetenskaps-Soc. Bidrag Natur och Folk **37**:162. 1882; Finl. Basidsv. 440. 1889;

Sacc. Syll. Fung. 6:660. 1888; Bresadola, (Hym. Hung. Kmet.), I. R. Accad. Agiati Atti III. 3:114. 1897.

Corticium (Tomentella) ferrugineum Persoon, Obs. Myc. 2:18. 1799. — *Thelephora ferruginea* Persoon, Syn. Fung. 2:578. 1801; Myc. Eur. 1:141. 1822; Fries, Elenchus Fung. 1:198. 1828; Epicr. 543. 1838. — *Corticium ferrugineum* subgenus *Hypochnus* Fries, Hym. Eur. 661. 1874. — *Hypochnus ferruginosus* (Fr.) Patouillard, Tab. Anal. Fung. 17. *f. 26.* 1883. — *Tomentella ferruginea* Pers. ex Schroeter, Krypt.-Fl. Schlesien 3:419. 1888.

Illustrations: Patouillard, Tab. Anal. Fung. *f. 26.*

Fructification effused, adnate, often suborbicular, thin, dry, tomentose, hypochnoid, drying Sudan-brown; structure in section about 300μ thick, composed of loosely interwoven, even-walled hyphae 4½–5μ in diameter, nodose-septate, concolorous through the whole fructification with the hymenium; no cystidia; basidia 4-spored; spores subglobose, concolorous with the fructification, echinulate, body of spore about 7–8μ in diameter.

Fig. 1
H. ferrugineus.
Hypha, spore
×640.

Fructifications 2–4 cm. in diameter or 3–6 cm. long, about 2–3 cm. broad.

Under side decaying limbs and logs of various frondose species. Canada and New Brunswick to Georgia and westward to Michigan. July to October. Occasional.

This species is well marked by its very constant color, common to both hyphae and spores, and its occurrence in adnate, small, and very thin, hypochnoid areas of the form and dimensions given. American collections agree closely in above respects with the European specimens received from Bresadola which he has noted as surely *H. ferrugineus.*

Specimens examined:[1]

Sweden: Femsjö, *L. Romell, 225, 227.*

Austria-Hungary: Trentino, *G. Bresadola;* Tatra Magna,

[1]With regard to the citation of specimens, all except those of "Exsiccati" are in Burt Herbarium, which are cited without explicit reference to place in other herbaria. For example, the specimens cited "Sweden: Femsjö, *L. Romell, 225, 227,*" are in Burt Herbarium. The data given is that received with the

Löcse, *V. Greschik,* comm. by G. Bresadola.
New Brunswick: Campobello, *W. G. Farlow.*
New Hampshire: Chocorua, *W. G. Farlow.*
Massachusetts: Belmont Spring, *C. Bullard,* comm. by W. G. Farlow; Sharon, *A. P. D. Piguet,* comm. by W. G. Farlow.
New York: Alcove, *C. L. Shear, 1316,* in part; East Galway, *E. A. Burt,* two collections.
Georgia: Tallulah Falls, *A. B. Seymour,* comm. by W. G. Farlow (in Mo. Bot. Gard. Herb., 43911).
Wisconsin: Blue Mounds, *E. T. & S. A. Harper, 876.*

2. H. rubiginosus Bresadola, (Hym. Hung. Kmet.), I. R. Accad. Agiati Atti III. **3**:114. 1897.

Zygodesmus rubiginosus Peck, N. Y. State Mus. Rept. **30**:58. 1879. — *Tomentella rubiginosa* (Bres.) R. Maire, Ann. Myc. **4**:335. 1906.

Type: in Bresadola Herb.; probably a portion in Burt Herb.

Fructifications effused, membranaceous, somewhat separable from the substratum, dry, tomentose, drying Brussels-brown; hymenium even or granular; structure in section about 200–300μ thick, with all the hyphae bright-colored and giving their color to the fructification, about 3μ in diameter, nodose-septate, thin-walled, lax, loosely interwoven towards the hymenium, longitudinally arranged next to the substratum, and occasionally consolidated there in rope-like, branching strands up to 15μ in diameter; no cystidia; spores concolorous with the fructification or more intensely colored, subglobose-angular, aculeate, body about 6–7μ in diameter, or 7–8$\times$6μ.

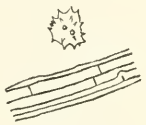

Fig. 2
H. rubiginosus. Hyphal strand, spore×640.

Fructifications about 1½–3 cm. long, 1–2 cm. broad.

On decaying leaves and decaying wood. Canada, New York, Louisiana, and British Columbia. October. Rare.

specimens and may identify duplicates in another herbarium. The location of all specimens in herbaria other than my own is designated by giving in parenthesis the name of the herbarium preceded by "in." For example, the specimen cited "Georgia: Tallulah Falls, *A. B. Seymour,* comm. by W. G. Farlow (in Mo. Bot. Gard. Herb., 43911)," is in Missouri Botanical Garden Herbarium, but not in Burt Herbarium.

H. rubiginosus is very similar in color throughout to *H. ferrugineus* but differs in being membranaceous, in having spores aculeate rather than spinulose, and in having some hyphae parallel with substratum and occasionally forming rope-like strands. These strands are not mentioned by Bresadola in his description, but they are present in preparations from the specimen received from him and also in those from the few American collections referable to this species.

Specimens examined:

Hungary: on leaves of *Juniperus* and *Quercus,* Oct., 1888, *Kmet,* comm. by G. Bresadola, apparently part of type.

Canada: Lower St. Lawrence Valley, *J. Macoun, 77.*

New York: Greenbush, *C. H. Peck,* type of *Zygodesmus rubiginosus* (in Coll. N. Y. State); Alcove, *C. L. Shear, 1329;* Syracuse, *L. M. Underwood, 36, 41* (both in Coll. N. Y. State).

Louisiana: St. Martinville, *A. B. Langlois, ct.*

British Columbia: Sidney, *J. Macoun, 80,* in part (in Mo. Bot. Gard. Herb., 8935).

3. H. subferrugineus Burt, n. sp.

Type: in Burt Herb.

Fructification effused, dry, membranaceous, separable from the substratum as a thin membrane, tomentose, drying Sudan-brown, with surface often granular in the center; structure in section 300–400μ thick, composed of (1) a few dark-colored, nodose-septate hyphae 5–6μ in diameter, running parallel with the substratum, loosely interwoven or sometimes in rope-like strands which give off (2) suberect, bright-colored, interwoven branches, concolorous with the hymenium, bearing the basidia; basidia 4-spored; spores concolorous with the hymenium, subglobose, echinulate, with spore body 7–9×6–8μ; some color is dissolved from the sections when they are treated with KHO solution.

Fig. 3
H. subferrugineus.
Hypha, spore×640.

Fructifications 2–5 cm. long, about 2–3 cm. broad.

Under side of decaying limbs and logs of both coniferous and frondose species. Canada and New England to Michigan, and in British Columbia; also in Sweden. August to October. Occasional.

This species has the same color externally as *H. ferrugineus,* from which it differs in being more compact, so that it is membranaceous and may be cautiously peeled up from the substratum. Dried specimens often have their central portion cracked and curled away from the substratum, while *H. ferrugineus* is adnate. Furthermore, *H. subferrugineus* has hyphae next to the substratum dark-colored and arranged longitudinally along the surface of the substratum, which is not the case in *H. ferrugineus.*

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 421, under the name *Zygodesmus rubiginosus.*

Sweden: Femsjö, *L. Romell, 233.*

Canada: definite locality not stated, *J. Macoun, 11;* St. Lawrence Valley, *J. Macoun, 20.*

New Hampshire: Chocorua, *W. G. Farlow, 1, 3,* a collection dated Sept., 1903, and a collection dated 1915 — the last (in Mo. Bot. Gard. Herb.).

Vermont: Middlebury, *E. A. Burt,* two collections.

New York: Sylvan Beach, Oneida Co., *H. D. House* (in N. Y. State Mus. Herb. and in Mo. Bot. Gard. Herb., 5893).

New Jersey: Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 421.

Michigan: Ann Arbor, *A. H. W. Povah, 4* (in Mo. Bot. Gard. Herb., 11774).

British Columbia: Sidney, *J. Macoun, 26,* in part (in Mo. Bot. Gard. Herb., 8933).

4. H. canadensis Burt, n. sp.

Type: in Burt Herb.

Fructifications small, effused, membranaceous, easily separable from the substratum, dry, tomentose, drying between Brussels-brown and hazel, the margin very thin, fibrous;

hymenium even or granular; in structure 400–500μ thick, composed (1) next to the substratum of a few dark-colored, longitudinally arranged, nodose-septate hyphae 4–4½μ in diameter, and (2) towards the hymenium of pale, thin and even-walled hyphae about 2½–3μ in diameter, suberect, very loosely interwoven, which arise as lateral branches from the dark basal hyphae and bear basidia and cystidia; cystidia septate, cylindric, obtuse, even-walled, Saccardo's umber in color under the microscope, 4½–5μ in diameter, emerging up to 80–100μ; basidia 4-spored with the spores on slender sterigmata about 6μ long; spores Saccardo's umber under the microscope, globose, tuberculate, spore body 6–7μ in diameter.

Fig. 4 H. canadensis. Cystidium, spore ×640.

Fructification usually 1–2 cm. long, ½–1 cm. broad, one specimen 4 cm. long.

On wood and bark of conifers decaying on the forest floor. Canada and New Hampshire to Idaho and British Columbia. August to November.

H. canadensis is a little darker in color than *H. ferrugineus* and is smaller and less conspicuous in the few collections which have been made. It differs from our other rust-colored species of *Hypochnus* in having cystidia. It is related to the European **Hypochnus ferruginosus** (v. Höhn. & Litsch.) Burt, n. comb., = *Tomentellina ferruginosa* v. Höhn. & Litsch, by the colored, cylindric cystidia, but the cystidia of our species are shorter and its hyphae finer, darker, and nodose-septate next to the substratum.

Specimens examined:

Canada: locality not stated, *J. Macoun, 11.*

Quebec: Ironsides, *J. Macoun, 277b.*

New Hampshire: Chocorua, *W. G. Farlow, 2,* and *c4* (the latter in Mo. Bot. Gard. Herb., 44039).

Vermont: Middlebury, *E. A. Burt,* type.

Michigan: Ann Arbor, *C. H. Kauffman, 36.*

Idaho: Priest River, *J. R. Weir, 1.*

British Columbia: Kootenai Mountains, near Salmo, *J. R. Weir, 504* (in Mo. Bot. Gard. Herb.).

5. H. umbrinus (Fries) Burt, n. comb.

Thelephora umbrina Fries, Elenchus Fung. **1**:199. 1828, but not *T. umbrina* Alb. & Schw. Consp. Fung. 281. 1805. — *Corticium umbrinum* Fries, Hym. Eur. 658. 1874. — *Thelephora biennis* Fries, Hym. Eur. 636. 1874, but not *T. biennis* Fries, Syst. Myc. **1**:449. 1821. — *T. arachnoidea* Berk. & Broome, Linn. Soc. Bot. Jour. **14**:64. 1873, but not *T. arachnoidea* as understood by Bresadola, Ann. Myc. **1**:108. 1903. — *Hypochnus tristis* Karsten, Soc. pro Fauna et Flora Fennica Meddel. **9**:71. 1883; Bresadola, Ann. Myc. **1**:107. 1903. — *Hypochnopsis fuscata* Karsten, Finl. Basidsv. 443. 1889. — *Hypochnus fuscatus* Karsten in Sacc. Syll. Fung. **9**:244. 1891. — *Tomentella tristis* (Karst.) v. Höhnel & Litschauer, K. Akad. Wiss. Wien Sitzungsber. **115**:1572. 1906. — *Hypochnus sitnensis* Bresadola, I. R. Accad. Agiati Atti III. **3**:115. 1897.

Type: in Herb. Fries, and an authentic specimen from Fries in Kew Herb.

Fructification effused, soft, separable, with the hymenial surface compact and membranaceous, varying from drab to fuscous and Chaetura-drab, underneath villose; structure in section 400–600μ thick, with some hyphae running along the substratum and ascending so as to form a loosely arranged layer near the substratum and then branching repeatedly to form a compact hymenium; hyphae concolorous with the fructification, thick-walled, not nodose-septate, not rough-walled, 4–5μ in diameter; basidia with 4 sterigmata; spores concolorous, globose or subglobose, aculeate or coarsely tuberculate, 6–7μ in diameter or 6–8 $\times$ 4½–7μ; KHO solution dissolves some pigment from the sections and becomes dark-colored in their vicinity.

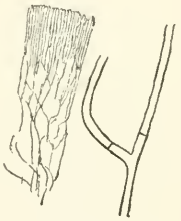

Fig. 5
H. umbrinus.
Section×75
Hypha×640.

Fructifications 6–10 cm. long, 3–5 cm. broad.

On rotting coniferous and frondose wood. New England to British Columbia. September to October. Common and cosmopolitan.

Hypochnus umbrinus (Fr.) is noteworthy among the dark species by its hyphae not being nodose-septate, i. e., not having clamp connections. Its tuberculate or aculeate spores and compact hymenium afford additional distinctive characters.

Thelephora umbrina Alb. & Schw. is regarded now by European botanists as a *Coniophora,* of which I have a specimen from Bresadola; what Fries understood by *T. umbrina* is exactly shown by an authentic specimen in Kew Herbarium. This specimen is a true *Hypochnus* in fine condition, dark-colored, with compact hymenium separated from the substratum by a thick layer of loosely arranged, suberect, thick-walled, colored hyphae, which do not have clamp connections. *T. biennis,* as used by Fries in 1821, is a description of the illustration in Bulliard's 'Herb. de la France' 2:286. *pl. 436. f. 2.* Fries stated that he had seen no specimens at that time. In 'Hymenomycetes Europaei,' published in 1874, he changed the description of *T. biennis* materially to adapt it to living specimens which he had seen. The resupinate specimen of this later period in Herb. Fries is not distinct from *Hypochnus umbrinus.* Authentic specimens of *H. tristis* and *Hypochnopsis fuscata* received from Karsten, and of *Hypochnus sitnensis* from Bresadola are the same species as already pointed out by Bresadola;[1] still earlier, Romell stated in letters his belief that *H. tristis* is a synonym of *H. umbrinus.* My studies lead to the same conclusion. The type specimen of *Thelephora arachnoidea* Berk. & Broome agrees closely with the Friesian specimen of *H. umbrinus.* Bresadola[2] has described hyphae of *T. arachnoidea* as "punctato-scabrae vel tunica granoso-aculeolata primitus inductae, usque ad 9μ crassae," but in my preparation of the type of *T. arachnoidea* the walls of the hyphae are even and not more than 4½μ in diameter.[3]

[1]Ann. Myc. 1:107. 1903.

[2]*Ibid.,* p. 108.

[3]In the same connection Bresadola places *Thelephora floridana* Ell. & Ev. as a synonym of *T. arachnoidea,* and he has been followed in this by von Höhnel. My preparations of the type of *T. floridana* in N. Y. Bot. Gard. Herb. show that this species is not a basidiomycete, and that its hyphae are nodose-septate.

Specimens examined:

Sweden: Smolandia, from E. Fries (in Kew Herb.); Femsjö, *L. Romell, 234, 235,* and *E. A. Burt;* Stockholm, *L. Romell, 229–232.*

Finland: Mustiala, *P. Karsten,* authentic specimen of *H. tristis;* Messuby, *P. Karsten,* authentic specimen of *Hypochnopsis fuscata.*

Hungary: *A. Kmet,* comm. by G. Bresadola, authentic specimen of *Hypochnus sitnensis.*

Ceylon: Habgalla, No. 539, Feb., 1868, the type of *Thelephora arachnoidea* Berk. & Broome (in Kew Herb.).

Canada: *J. Macoun, 64.*

Ontario: Harraby, *E. T. & S. A. Harper, 593.*

New Hampshire: Chocorua, *W. G. Farlow, 9, 13, 14, 15, 22.*

Vermont: Middlebury, *E. A. Burt.*

Massachusetts: Sharon, *A. P. D. Piguet,* comm. by W. G. Farlow.

New York: Lake Placid, *C. H. Peck;* Floodwood, *E. A. Burt.*

Wisconsin: Blue Mounds, *E. T. & S. A. Harper, 860.*

British Columbia: Kootenai Mountains, near Salmo, *J. R. Weir, 441, 487* (in Mo. Bot. Gard. Herb., 8227, and 20225 respectively).

6. H. fuscus Pers. ex Fries, Obs. Myc. **2**:280. 1818 and 1824; Karsten, Finska Vetenskaps-Soc. Bidrag Natur och Folk **37**:163. 1882.

Corticium fuscum Persoon, Obs. Myc. **1**:38. 1796; Fries, Hym. Eur. 651. 1874. — *Thelephora fusca* Fries, Syst. Myc. **1**:451. 1821. — *Thelephora vinosa* Persoon, Syn. Fung. **2**:578. 1801. — *Tomentella fusca* (Pers.) Schroeter, Krypt.-Fl. Schlesien **3**:419. 1888.

Type: existence of an authentic specimen unknown to me.

Fructification effused, membranaceous, separable, cinnamon-drab, darkening to Benzo-brown and Natal-brown; structure in section 200–350μ thick, with a few hyphae running along the substratum and ascending and branching or giving off suberect, loosely interwoven branches; hyphae concolorous with the fructification but rather pale under the microscope,

Fig. 6 H. fuscus. Spores ×640.

nodose-septate, 4–6μ in diameter, sometimes collapsed; basidia with 4 sterigmata; spores darker than the hyphae, subglobose, sometimes flattened on one side, the spore body 6–7μ in diameter and short-aculeate in European and occasional American specimens, but more commonly 6–8 $\times$ 6μ and echinulate in American specimens.

Fructifications 2–10 cm. long, 1–2 cm. broad.

On rotten coniferous and frondose wood of several species. Canada and New Brunswick to New Jersey and in Montana. July to October.

In the color of *H. fuscus,* there is a perceptible vinaceous component by which the species may be approximately recognized at sight. Confirmatory characters are the separable fructification and microscopical details of sections. The spores of most American specimens have slenderer and longer spines than those of European collections. *H. fuscus* is presented here as understood by Bresadola.

Specimens examined:

Sweden: Stockholm, *L. Romell, 224.*

Hungary: *A. Kmet,* comm. by G. Bresadola.

Canada: locality not given, *J. Macoun, 14;* Ottawa, *J. Macoun, 28.*

New Brunswick: Campobello, *W. G. Farlow, 4.*

Massachusetts: Magnolia, *W. G. Farlow,* two collections.

New York: Albany, *H. D. House & Jos. Rubinger* (in Mo. Bot. Gard. Herb., 8736); East Galway, *E. A. Burt;* Potsdam, *J. B. Ellis* (in Farlow Herb.).

New Jersey: Newfield, *J. B. Ellis* (in N. Y. Bot. Gard. Herb., under the name *Thelephora floridana*).

Montana: Missoula, *J. R. Weir, 400* (in Mo. Bot. Gard. Herb., 22161).

7. H. spongiosus (Schw.) Burt, n. comb.

Thelephora spongiosa Schweinitz, Naturforsch. Ges. Leipzig Schrift. **1**:109. 1822; Am. Phil. Soc. Trans. N. S. **4**:168. 1834; Fries, Elenchus Fung. **1**:193. 1828; Sacc. Syll. Fung. **6**:545. 1888. — *Hypochnus obscuratus* Karsten, Hedwigia **35**:46. 1896; Sacc. Syll. Fung. **14**:226. 1900.

Type: in Herb. Schweinitz.

Fructification effused, soft, felty-membranaceous, separable, in color varying from Saccardo's umber to bister, rarely fuscous, the margin thinning out and barely determinate; in structure 200–1200μ thick, with hyphae concolorous with the fructification, thick-walled, even, loosely interwoven, branching at a wide angle, abundantly nodose-septate, 4½–5μ in diameter or rarely 6μ; basidia with 4 sterigmata; spores concolorous, globose, or subglobose and flattened on one side, echinulate, about 6μ in diameter, or 6–9 $\times$ 6–7μ.

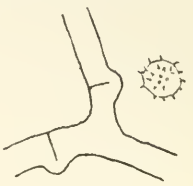

Fig. 7
H. spongiosus. Hypha, spore ×640.

Fructifications 4–10 cm., and more, long, 2–5 cm. broad.

On rotten wood and bark of both frondose and coniferous species. Canada to North Carolina and westward to Montana, and in Bahama Islands. July to November. Probably common.

H. spongiosus belongs in the group with *H. fuscus, H. umbrinus,* and *H. spiniferus.* The absence of a vinaceous component in its color is a useful character for separation at a glance from *H. fuscus.* If the surface of *H. spongiosus* is viewed with a lens, the component fibers are seen running in all directions, as in felt or blotting paper. *H. umbrinus* has its hyphae lacking clamp connections, i. e., not nodose-septate, and its basidia form a compact hymenium. *H. spiniferus* differs by having its hyphae spiny.

Specimens examined:

Finland: Mustiala, *P. A. Karsten,* authentic specimen of *Hypochnus obscuratus.*

Canada: Quebec, Ironsides, *J. Macoun, 255.*

New Hampshire: Chocorua, *W. G. Farlow, 14.*

Vermont: Middlebury, *E. A. Burt,* three collections; Lake Dunmore, *E. A. Burt.*

New York: Albany, *H. D. House* (in N. Y. State Mus. Herb. and in Mo. Bot. Gard. Herb., 15833).

North Carolina: *Schweinitz,* type (in Herb. Schweinitz).

Indiana: Miller, *E. T. & S. A. Harper, 758.*

Wisconsin: Lake Geneva, *E. T. & S. A. Harper, 950.*
Montana: Evaro, *J. R. Weir, 436, 438* (in Mo. Bot. Gard. Herb., 19515 and 19597 respectively).
Bahama Islands: *A. E. Wight* (in Farlow Herb.).

8. H. spiniferus Burt, n. sp.

Type: in Farlow Herb. and in Burt Herb.

Fructification effused, membranaceous, separable, tomentose, varying from sepia to fuscous; in structure about 1000μ thick, with the hyphae loosely interwoven, nodose-septate, thick-walled, concolorous with the fructification but darker near the substratum and spinulose, the paler hyphae rough-walled or even, body of largest hyphae 4–5μ in diameter, the spines about 1μ long, colored like the dark wall; basidia with 4 sterigmata; spores concolorous, globose, sometimes flattened on one side, echinulate, the body 6–8μ in diameter, or 6 × 4½–6μ.

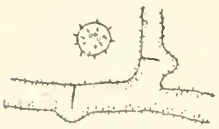

Fig. 8
H. spiniferus
Hypha, spore×640.

Fructifications about 5 cm. long, 3 cm. broad.

On rotten wood. New Hampshire and Massachusetts. August. Rare.

H. spiniferus is so similar to *H. spongiosus* in habit and coloration that it can be separated from the latter only by the distinctly spiny-walled and rough-walled hyphae of the former species. This character is as marked as in the capillitium of some *Myxomycetes.* The New Hampshire collections which I have included under *H. spiniferus* have rough-walled hyphae and no spines.

Specimens examined:
New Hampshire: Chocorua, *W. G. Farlow, 11,* and *an unnumbered specimen* collected in 1904.
Massachusetts: Magnolia, *W. G. Farlow,* type.

9. H. granulosus (Peck) Burt, n. comb.

Grandinia tabacina Cooke & Ellis, Grevillea **9**:103. March, 1881, but not *Hypochnus tabacinus* Bresadola. — *Zygodesmus granulosus* Peck, Bot. Gaz. **6**:277. 1881. — *Hypochnus elaeodes* Bresadola, I. R. Accad. Agiati III. **3**:115. 1897.

Type: in Coll. N. Y. State.

Fructification effused, thin, membranaceous, separable from the substratum, granular, sepia, the margin somewhat radiate, concolorous or nearly so; in structure 200–400μ thick, composed of very loosely interwoven, thin-walled, occasionally nodose-septate, hyphae 2½–4μ in diameter, yellowish under the microscope, forming near the substratum some rope-like mycelial strands up to 15μ in diameter; spores concolorous with the hyphae, angular-subglobose, aculeate, the body about 6μ in diameter; KHO solution produces no noteworthy color change in sections.

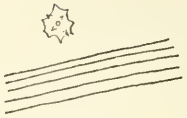

Fig. 9
H. granulosus. Spore, hyphal strand×640.

Fructifications 2–4 cm. long, 1–2 cm. broad.

On rotten bark and wood of frondose species. Massachusetts to New Jersey and Ohio. September to November. Rare.

H. granulosus is very closely related to *H. coriarius* and is distinguished from it by uniform color of the whole surface, while *H. coriarius* has the margin ochraceous-tawny. The lack of noteworthy color change by KHO solution is the only additional feature of difference for separating *H. granulosus* from *H. coriarius.* The specific name *tabacina* of Cooke and Ellis has priority, but is not now available because Bresadola has already used the name *Hypochnus tabacinus* for a valid species.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 421, under the name *Zygodesmus chlorochaites.*

Hungary: *A. Kmet,* authentic specimen of *H. elaeodes* from Bresadola, probably a portion of the type.

Massachusetts: Newton, *W. G. Farlow;* Mt. Tom, *H. W. Harkness,* type (in Coll. N. Y. State).

New York: Albany, *H. D. House & J. Rubinger* (in Mo. Bot. Gard. Herb., 8733); Karner, *H. D. House* (in Mo. Bot. Gard. Herb., 44731); Alcove, *C. L. Shear, 1316,* in part.

New Jersey: Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 421, and also the cotype of *Grandinia tabacina* (in N. Y. Bot. Gard. Herb.).

Ohio: *A. P. Morgan, 525* (in N. Y. Bot. Gard. Herb., under the manuscript name *Odontia olivacea*).

10. H. olivascens (Berk. & Curtis) Burt, n. comb.

Zygodesmus olivascens Berk. & Curtis, Grevillea 3:145. 1875.

Type: type and cotype in Kew Herb. and in Curtis Herb.

Fructification effused, thin, not separable, tomentose, citrine, yellowish citrine or buffy citrine, the margin thinning out; KHO solution dissolves some of the color upon coming in contact with the sections and becomes somewhat brownish in their vicinity; in structure 150–200μ thick, with now and then a hypha running along the substratum and sending out suberect branches which branch repeatedly, become loosely interwoven, and are somewhat clustered; basal hyphae slightly colored, nodose-septate, thin-walled, 5–6μ in diameter; basidia with 4 sterigmata; spores subglobose, concolorous with the basal hyphae, aculeate-echinulate, the body about 6μ in diameter or 5½–7½ × 5½–7μ.

Fig. 10
H. olivascens.
Spore×640.

Fructifications sometimes in little patches 1–2 cm. long, 1½–1 cm. broad, sometimes growing more or less interruptedly over areas up to 15 cm. long, 3 cm. broad.

On very rotten wood and on bark of fallen branches of both coniferous and frondose species. New Brunswick to South Carolina. September to November. Probably common.

H. olivascens is readily distinguished from other species of *Hypochnus* by its conspicuous citrine color of some kind (flavovirens of Saccardo's 'Chromotaxia') which has been retained well by the original collection for more than sixty years. From the description, *Tomentella flavovirens* v. Hohn. & Litsch. is but slightly, if at all, different from *H. olivascens.*

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 422, under the name *Zygodesmus olivascens.*

New Brunswick: Campobello, *W. G. Farlow, 5.*

New Hampshire: Chocorua, *W. G. Farlow, 5, 6, 18.*

Vermont: Weybridge, *E. A. Burt.*

Massachusetts: Magnolia, *W. G. Farlow;* Hyde Park, *C. Bullard,* comm. by W. G. Farlow; Sharon, *A. P. D. Piguet* (in Farlow Herb.); Stony Brook, *G. R. Lyman, 167;* Williamstown, *W. G. Farlow, 7.*

New York: North Greenbush, *H. D. House,* two collections (in N. Y. State Mus. Herb. and in Mo. Bot. Gard. Herb., 14852, 20191); Karner, *H. D. House* (in N. Y. State Mus. Herb. and in Mo. Bot. Gard. Herb., 44719); Ithaca, *C. Thom,* Cornell Univ. Herb., 13582.

New Jersey: Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 422.

Pennsylvania: Kittanning, *D. R. Sumstine.*

Maryland: Takoma Park, *C. L. Shear, 1064, 1082, 1092.*

South Carolina: Society Hill, *M. A. Curtis,* cotype (in Curtis Herb., 3204).

11. H. pilosus Burt, n. sp.

Type: in Burt Herb.

Fructification effused, byssoid, membranaceous, separable from substratum, dry, tomentose, drying Sayal-brown, the margin slightly paler, thin, narrow; hymenium even in places, somewhat granular and pitted elsewhere; structure in section 200–300μ thick, composed of hyphae about 4–4½μ in diameter, branching at right angles, of the same color as the fructification, nodose-septate, rather rigid, very loosely interwoven, somewhat longitudinally interwoven next to the substratum; cystidia septate, sometimes granular incrusted, with the emergent portion colorless, thin-walled, cylindric, 5½–6μ in diameter, emerging 40–90μ, tips obtuse or clavate; spores 4 to a basidium, slightly darker than

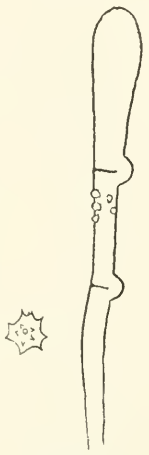

Fig. 11
H. pilosus. Spore, cystidium×640.

the hyphae, subglobose-angular, aculeate, the spore body 7–9 × 6μ.

Fructification 8 cm. long, 2–3 cm. broad — broken off at one end.

On bark of decaying *Quercus alba,* Lake Geneva, Wisconsin, July.

This fungus suggests *Coniophora arida* and *C. puteana* by its umber color and broadly effused fructifications, but it is a true *Hypochnus,* which is readily distinguished from other species of this genus by its color, hair-like cystidia, and the spores.

Specimens examined:
Wisconsin: Lake Geneva, *E. T. & S. A. Harper, 877.*

12. H. isabellinus Fries, Obs. Myc. **2**:281. *pl. 6. f. 3.* 1818 and 1824; Sacc. Syll. Fung. **6**:657. 1888; Bresadola, Ann. Myc. **1**:106. 1903.

Corticium isabellinum (in section *Hypochnus*) Fries, Hym. Eur. 660. 1874. — *H. argillaceus* Karsten, Soc. pro Fauna et Flora Fennica Meddel. **6**:13. 1881; Sacc. Syll. Fung. **6**: 661. 1888.

Type: there is a specimen from E. P. Fries in Curtis Herb.

Fructification effused, tomentose, thin, adnate, varying from deep olive-buff to dark olive-buff, the margin thinner, concolorous; in structure 60–200μ, rarely 300μ, thick, with a few hyphae 8–10μ, or more, in diameter, running along the substratum and sending out suberect, loosely interwoven branches; hyphae concolorous with the fructification, branching at right angles, thick-walled, not nodose-septate; basidia with 4 sterigmata; spores concolorous, globose, echinulate, the spore body 7–9μ in diameter.

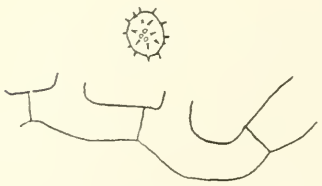

Fig. 12
H. isabellinus.
Spore, hypha×640.

Fructification 5–10 cm. long, 1½–3 cm. broad, and probably larger.

On rotten wood and bark of both coniferous and frondose species. Canada to Florida, in Wisconsin and in Jamaica. May to January. Probably common.

H. isabellinus is a little thinner and a little paler than *H. pannosus,* and not separable from the substratum in the collections which I have studied. It is best distinguished from the latter species by the larger hyphae of *H. isabellinus* and lack of clamp connections.

Specimens examined:

Exsiccati: Ravenel, Fungi Am., 57b, under the name *Zygodesmus pannosus;* Thümen, Myc. Univ., 2275, under the name *Zygodesmus pannosus.*

Sweden: Upsala, Halmbyboda, from E. P. Fries (in Curtis Herb.); Stockholm, *L. Romell, 219–222;* Femsjö, *L. Romell, 223,* and *E. Fries* (in Herb. Fries under the manuscript name *Hypochnus leprosus*).

Canada: Rockcliffe Park, *J. Macoun, 144;* St. Lawrence Valley, *J. Macoun, 2.*

New Hampshire: Chocorua, *W. G. Farlow,* two collections.

New Jersey: Newfield, *J. B. Ellis,* in Thümen, Myc. Univ., 2275.

Florida: Gainesville, *H. W. Ravenel,* in Ravenel, Fungi Am., 57b.

Wisconsin: New London, *E. T. & S. A. Harper, 949;* Stevens Point, *C. J. Humphrey, 1948* (in Mo. Bot. Gard. Herb., 4748).

Jamaica: Cinchona, *W. A. & Edna L. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 630.

13. H. pannosus (Berk. & Curtis) Burt, n. comb.

Zygodesmus pannosus Berk. & Curtis, Grevillea **3**:112. 1875.

Type: cotype in Curtis Herb.

Fructification effused, byssoid-membranaceous, separable when well developed, tomentose, varying in brown from Saccardo's umber and snuff-brown to cinnamon-brown, the margin concolorous and thinning out; in structure 120–350μ thick, with an occasional hypha running along the substratum

but composed for the most part of suberect, branching, loosely interwoven, nodose-septate, thick-walled hyphae concolorous with the fructification, 4–6μ in diameter; basidia with 4 sterigmata; spores concolorous with the fructification, subglobose, sometimes flattened on one side, echinulate, the body 6–8 × 5–7μ.

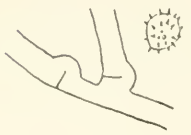

Fig. 13
H. pannosus.
Spore, hypha ×640.

Fructification 3–6 cm. long, 1½–3 cm. broad.

On rotten wood and bark, usually of frondose species, and on the ground in woods. Canada to Louisiana; occurs in Europe also. September to December. Probably common.

H. pannosus and *H. isabellinus* are species of brown color approaching clay-color, and of cottony surface, which cannot be distinguished from each other with certainty except by microscopic characters. Well-developed fructifications of *H. pannosus* are thicker than those of *H. isabellinus* but thin fructifications of the former are frequently collected. *H. pannosus* has nodose-septate hyphae 4–6μ in diameter, while the hyphae of *H. isabellinus* are not nodose-septate and next to the substratum are 8–10μ, or more, in diameter, and occasionally 15μ in diameter. KHO solution produces no noteworthy color change. The collection from Washington, referred with doubt to this species, has the spores with body 6 × 4½μ, aculeate with scattered, very short points.

Specimens examined:

Sweden: Stockholm, *L. Romell, 225;* Femsjö, *L. Romell, 228.*
Canada: Quebec, Ironsides, *J. Macoun, 277a.*
New Hampshire: Chocorua, *W. G. Farlow, 7, 8,* and *an unnumbered specimen;* Shelburne, *W. G. Farlow, 1.*
Vermont: Middlebury, *E. A. Burt.*
Massachusetts: Magnolia, *W. G. Farlow, c;* Williamstown, *W. G. Farlow, 5.*
South Carolina: Santee Canal, *Ravenel, 1117,* cotype (in Curtis Herb., 3007).
Louisiana: St. Martinville, *A. B. Langlois, cs.*

?Washington: Bingen, on *Pinus ponderosa, W. N. Suksdorf, 860.*

14. H. avellaneus Burt, n. sp.

Type: in Burt Herb.

Fructification effused, soft, membranaceous, separable, upper side between cartridge-buff and olive-buff and under side fuscous, the margin narrow, radiate, colored like the upper surface or whitish; in structure 300–400μ thick, with the hyphae snuff-brown under the microscope, thick-walled, nodose-septate, rather compactly interwoven; basidia 4-spored; spores concolorous with the hyphae, angular-subglobose, aculeate, the body 6–7½ × 6μ.

Fig. 14
H. avellaneus. Hypha, spore× 640.

Fructification 5 cm. long, 1 cm. broad.

On wood of red fir in woods. Washington. October.

This species is marked by the pale color (nearly avellaneus of Saccardo's 'Chromotaxia') of the upper surface and margin and the fuscous subiculum.

Specimens examined:

Washington: Olympia, *C. J. Humphrey, 6305,* type.

15. H. sparsus Burt, n. sp.

Type: in Farlow Herb. and in Burt Herb.

Fig. 15
H. sparsus. Spore, hypha ×640.

Fructification effused, very thin, byssoid, not forming a membrane, adnate, drab, the margin of the same color, indeterminate; in structure 60–75μ thick, with the hyphae hyaline under the microscope, short-celled, irregular in form and diameter, nodose-septate; basidia 4-spored; spores grayish olive under the microscope, echinulate, 6–7 × 6μ; no noteworthy color change by KHO solution.

Fructification 2–3 cm. long, 1–2 cm. broad.

On bark of fallen frondose limbs. New Hampshire. August.

When better known from other collections, *H. sparsus* may prove to be *H. pannosus* very sparsely developed. At pres-

ent it appears distinct from the latter by its adnate, very thin fructification and short-celled, hyaline hyphae of irregular form and mode of branching.

Specimens examined:

New Hampshire: Madison, *W. G. Farlow, 15,* type; Chocorua, *W. G. Farlow, 16.*

16. H. epigaeus Burt, n. sp.

Type: in Farlow Herb. and in Burt Herb.

Fructification effused, soft, felty-membranaceous, tomentose, light mineral-gray, the margin thinning out and indeterminate; in structure 400μ thick, with hyphae hyaline, 4μ in diameter, thick-walled, nodose-septate, densely interwoven for 100μ next the substratum and then suberect and ascending side by side to the hymenium; basidia with 4 sterigmata; spores hyaline to deep olive-buff under the microscope, angular-globose, rough-walled or aculeate with very short points; spore body 6–7μ in diameter.

Fig. 16
H. epigaeus.
Spores×640.

Fructification about 2 cm. in diameter.

Running over ground among small mosses. Massachusetts. August.

This species is marked by its color, two-layered fructification, thick-walled and hyaline hyphae, and spores hardly more than rough-walled. *H. cinerascens* occurs on wood, is drab-gray, and has very thin-walled and delicate, loosely arranged hyphae 2–3μ in diameter, and smaller spores than *H. epigaeus. H. chalybeus,* as received from Bresadola, is pale at the surface only and has colored hyphae constituting the greater part of the fructification.

Specimens examined:

Massachusetts: Manchester, *W. G. Farlow, 2,* type.

17. H. botryoides (Schw.) Burt, n. comb.

Thelephora botryoides Schweinitz, Naturforsch. Ges. Leipzig Schrift. **1**:109. 1822. — *T. olivacea* β *T. botryoides* Fries, Elenchus Fung. **1**:198. 1828; Schweinitz, Am. Phil. Soc. Trans. N. S. **4**:168. 1834; Fries, Epicr. 543. 1838. — *T.*

granosa Berk. & Curtis, Grevillea **1**:149. 1873; Sacc. Syll. Fung. **6**:546. 1888. — *Hypochnus granosus* (Berk. & Curtis) Bresadola, Ann. Myc. **1**:108. 1903. — *Zygodesmus bicolor* Cooke & Ellis, Grevillea **7**:6. 1878.

Type: in Herb. Schweinitz.

Fructification effused, membranaceous, separable, drying Chaetura-drab to fuscous, the margin much paler, brownish and floccose; hymenium distinctly and closely granular; in section 300–400μ thick, with hyphae 3–4μ in diameter, nodose-septate, somewhat colored, thin-walled, a few running along the substratum, or forming rope-like strands, and sending out suberect, loosely interwoven branches which form the greater part of the fructification; KHO solution causes an immediate change of color in the tissue of the granules to between blue-green and sage-green when added to bits of the fructification in microscopic preparations; spores concolorous with the fructification, angular-subglobose, aculeate, the spore body 5–6 × 4–5μ.

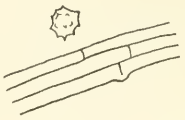

Fig. 17
H. botryoides. Spore, hyphal strand×640.

Fructifications 1–5 cm. long, 1–4 cm. broad.

On rotten wood, both coniferous and frondose. New Hampshire to South Carolina and Alabama. August to January.

The fuscous color of the central portion of the fructification, paler margin, and occurrence of granules about 4 to the mm. afford a good combination of characters for the recognition of *H. botryoides* by microscopic characters. Occasionally a fructification may vary towards Mars-brown. The blue-green color produced in the granules in microscopic preparations by adding KHO solution is a good positive character for this species, but is merely temporary.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 420, under the name *Zygodesmus bicolor* C. & E.

New Hampshire: Chocorua, *W. G. Farlow, 12,* and also a collection of Sept., 1915 (in Farlow Herb. and in Mo. Bot. Gard. Herb., 8930).

Vermont: Middlebury, *E. A. Burt,* two collections.

New York: Helderberg Mountains, *C. H. Peck* (in Coll. N. Y. State, under the name *Zygodesmus bicolor* C. & E.).
New Jersey: Belleplain, *C. L. Shear, 1253;* Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 420.
Pennsylvania: Bethlehem, *Schweinitz* (in Herb. Schweinitz, as the *Thelephora umbrina* of Schweinitz, Syn. N. Am. Fungi, No. 578).
Maryland: Takoma Park, *C. L. Shear, 1061, 1085.*
North Carolina: *Schweinitz,* type (in Herb. Schweinitz).
South Carolina: *M. A. Curtis, 2485, 3700,* types of *Thelephora granosa* (in Kew Herb.).
Alabama: *Peters,* type of *T. granosa* (in Kew Herb.).

18. H. coriarius (Peck) Burt, n. comb.

Grandinia coriaria Peck, Buffalo Soc. Nat. Hist. Bul. **1**:61. 1873; N. Y. State Mus. Rept. **26**:71. 1874. — *Hypochnus fulvo-cinctus* Bresadola, I. R. Accad. Agiati Atti III. **3**:116. 1897; Sacc. Syll. Fung. **14**:227. 1900.

Type: in Coll. N. Y. State.

Fructification effused, tomentose, membranaceous, separable from the substratum, under side and margin ochraceous-tawny, upper side and minute crowded granules brownish olive; in structure 200–350μ thick, composed of closely arranged, somewhat interwoven, colored, thin-walled, occasionally nodose-septate, hyphae 2½μ in diameter, forming occasional rope-like strands next to the substratum; basidia with 4 sterigmata; spores darker colored than the hyphae, subglobose-angular, aculeate, the body 5–6μ in diameter; KHO solution usually becomes dark colored next to the sections and changes the hymenial layer to sage-green.

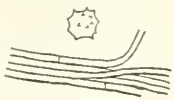

Fig. 18
H. coriarius.
Spore, hyphal strand×640.

Fructifications about 3–10 cm. long, 1½–4 cm. broad.

On rotten wood, noted also on old leather and thallus of *Peltigera aphthosa.* Vermont to South Carolina and westward to Wisconsin. August to November.

This species is related to *H. botryoides* but may be distinguished from it by the more olivaceous color of the granu-

lar region and brighter and more intensely colored margin and side next to substratum, and the rope-like hyphal strands next to substratum. The sage-green color given to hymenial tissue by KHO solution is a helpful determinative character in most cases; however, I have two collections which fail to give it. *H. coriarius* occurs in Herb. Schweinitz under the name *Thelephora punicea* Alb. & Schw. The specimen is the No. 676 of Schweinitz, 'Syn. N. Am. Fungi'; it does not agree well with the original description of Albertini and Schweinitz and is not what European mycologists now understand as *Thelephora* (*Hypochnus*) *punicea.*

Specimens examined:

Hungary: *A. Kmet,* type of *H. fulvo-cinctus* (in Bresadola Herb.).

Vermont: Lake Dunmore, *W. G. Farlow* (in Farlow Herb.); Middlebury, *E. A. Burt,* three collections.

New York: Greenbush, *C. H. Peck,* type (in Coll. N. Y. State).

Pennsylvania: Kittanning, *D. R. Sumstine;* Bethlehem, *Schweinitz* (in Herb. Schweinitz, under the name *Thelephora punicea*).

South Carolina: Gourdin, *C. J. Humphrey, 3281* (in Mo. Bot. Gard. Herb., 43118).

Ohio: *C. G. Lloyd, 3882, 4199.*

Wisconsin: Blue Mounds, *E. T. & S. A. Harper, 870.*

19. H. bicolor Atkinson & Burt, n. sp.

Type: in Burt Herb. and in Cornell Univ. Herb.

Fructification effused, membranaceous, separable, dry, central portion at the surface olive-ocher, underneath brownish drab and extended laterally as a brownish drab margin 1–5 mm. broad; structure in section about 400μ thick, (1) with the hyphae next the substratum slightly colored, thin-walled, lax, long-celled, nodose-septate, 3μ in diameter, either loosely interwoven or with some hyphae consolidated together into

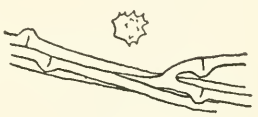

Fig. 19
H. bicolor.
Spore, hypha×640.

strands 6–15μ in diameter, and (2) with hyphae in the subhymenial region densely interwoven; no cystidia; basidia with spores on 4 slender sterigmata; spores olive-ocher, angular-subglobose, aculeate, the spore body 5–6 $\times$ 4½–6μ; KHO solution changes the color of both the olive-ocher and the brownish drab hyphae to sage-green, later olive-gray.

Fructification 2 cm. long, 1¼ cm. broad, with the fertile, olive-ocher portion 5–10 mm. in diameter.

On dead wood in woods. New York. August.

The single collection of this species which has been found is conspicuous by its bright olive-ocher hymenial portion surrounded by a brownish drab margin. Both of these colors are destroyed when potassium hydrate solution is brought in contact with sections of the fructification in making microscopic preparations, and the hyphae become at once sage-green, later olive-gray.

Specimens examined:

New York: Cascadilla Wood, Ithaca, *C. J. Humphrey,* comm. by G. F. Atkinson, Cornell Univ. Herb., 22571.

20. H. atroruber (Peck) Burt, n. comb.

Zygodesmus atroruber Peck, Bot. Gaz. **6**:277. 1881.

Type: in Coll. N. Y. State.

Fructification effused, membranaceous, separable, tomentose, with central portion granular and between walnut-brown and Vandyke-brown, the margin often conspicuously umber or Isabella-color (melleus of Saccardo's 'Chromotaxia'); structure in section 300–500μ thick, composed of loosely interwoven thick-walled, nodose-septate hyphae 5–6μ in diameter, concolorous with the fructification and connected with a few rope-like mycelial strands 12–20μ in diameter, which run along the substratum; basidia with 4 sterigmata; spores concolorous with the darker hyphae, subglobose, often flattened on one side, echinulate, the body 6–7 $\times$ 5–6μ.

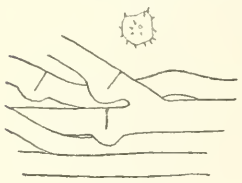

Fig. 20
H. atroruber. Spore, hyphal strand×640.

Fructifications 3–6 cm. long, 1–3 cm. broad.

On decaying wood. New Hampshire to Maryland. September to January. Probably frequent.

H. atroruber is one of our finest species of the genus. It is conspicuous by the dark red central region bordered by a melleus (in the sense of 'Chromotaxia') margin. This margin was not noticed by Peck in the original description but is present on one side of his type. Specimens of *H. atroruber* lacking the characteristic melleus margin may be distinguished from *H. rubiginosus* by the coarser, darker-colored, thicker-walled hyphae of the former species.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 1390, under the name *Zygodesmus atroruber* Pk.

New Hampshire: Chocorua, *W. G. Farlow, 10*, and collection of Sept., 1915 (in Farlow Herb. and in Mo. Bot. Gard. Herb., 8931).

Massachusetts: Mt. Tom, *H. W. Harkness,* type of *Zygodesmus atroruber* Pk. (in Coll. N. Y. State); Magnolia, *W. G. Farlow, b;* Sharon, *A. P. D. Piguet,* comm. by W. G. Farlow, 21.

New Jersey: Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 1390.

Maryland: Takoma Park, *C. L. Shear, 902, 1086.*

21. H. subvinosus Burt, n. sp.

Type: in Burt Herb.

Fructification effused, thin, adnate, becoming granular, tomentose, vinaceous-brown, but becoming Rood's brown in the herbarium; in structure 250–300μ thick, composed of suberect, branching, loosely interwoven, thin-walled hyphae 4–5μ in diameter, not nodose-septate, colored near the substratum and hyaline near the basidia; basidia with 4 sessile spores; spores umber, angular-subglobose, aculeate, the body 5–6μ in diameter, or 5–6 $\times$ 4–5μ; no noteworthy color change by KHO solution.

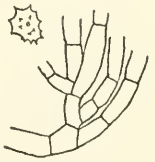

Fig. 21
H. subvinosus.
Spore, hypha×640.

Fructification 4 cm. long, 2½ cm. broad.

On bark of rotting frondose wood and on ground. New Hampshire to New Jersey. November. Rare.

The adnate habit, vinaceous-brown color of the fructifications, and the colored hyphae which are not nodose-septate, are the distinctive characters of *H. subvinosus*.

Specimens examined:

New Hampshire: Chocorua, *W. G. Farlow, 3;* Intervale, *R. Thaxter, 11* (in Farlow Herb. and in Mo. Bot. Gard. Herb., 43930).

Massachusetts: Sharon, *A. P. D. Piguet,* comm. by W. G. Farlow (in Mo. Bot. Gard. Herb., 43914).

New Jersey: Belleplain, *C. L. Shear, 1251,* type.

22. H. cervinus Burt, n. sp.

Type: in Burt Herb.

Fig. 22 H. cervinus. Hypha, spore ×640.

Fructifications in very small, interrupted, circular patches, becoming sometimes confluent and effused, byssoid, thin, not separable, fawn-color, with the under side and margin whitish; in structure 75–100μ thick, consisting of loosely interwoven, rather suberect, thin-walled hyphae 2½–3μ in diameter, nodose-septate, hyaline under the microscope; basidia with 4 sterigmata; spores slightly colored, subglobose, short aculeate, the body 5–6μ in diameter, or 6 × 5μ.

Fructifications 2–5 mm. in diameter, more or less confluent over an area 2 cm. long, 1 cm. broad.

On bark of dead *Acer macrophyllum* lying on the ground. Washington. November 1.

In the only collection which has been made, *H. cervinus* is characterized by its occurrence in very small, thin fructifications, not separable from substratum, fawn-color at the center with a whitish margin, and by having hyaline, nodose-septate hyphae. *H. cinerascens* is of different color, thicker, and separable from the substratum.

Specimens examined:

Washington: W. Klickitat County, *W. N. Suksdorf, 847,* type.

23. H. fuligineus Burt, n. sp.

Type: in Burt Herb. and in Farlow Herb.

Fructification effused, soft, felty-membranaceous, separable, upper surface pinkish buff to Isabella-color, under side and margin bister; in structure 200–1200μ thick, with hyphae bister under the microscope, thick-walled, nodose-septate, 5–7μ in diameter, a few running next to and parallel with the substratum and giving off suberect, loosely interwoven branches of the same color, 3½–4½μ in diameter; basidia with 4 sterigmata; spores bister under the microscope, globose or subglobose, echinulate, the body 6–7μ in diameter, or 6–9 × 6–7μ; no color change by KHO solution.

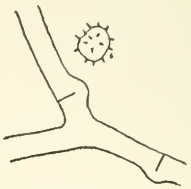

Fig. 23
H. fuligineus.
Hypha, spore×640.

Fructification 4–10 cm. long, 2–4 cm. broad.

On rotten frondose wood. New England and Wisconsin. August and September.

H. fuligineus is much thicker, firmer, and more spongy than *H. atroruber* and *H. cinerascens,* and differs from them further in coloration and in hyphal characters. In its thick spongy structure and microscopic details it suggests *H. spongiosus* to such a degree that I have been disposed to regard *H. fuligineus* as a subspecies of *H. spongiosus* but this seems precluded by the importance of color characters in *Hypochnus.*

Specimens examined:

New Hampshire: Chocorua, *W. G. Farlow, 4,* type.
Vermont: Middlebury, *E. A. Burt.*
Massachusetts: Magnolia, *W. G. Farlow, d,* and *an unnumbered collection* of 1903.
Wisconsin: Blue Mounds, *E. T. & S. A. Harper, 878.*

24. H. cinerascens Karsten, Soc. pro Fauna et Flora Fennica Meddel. **16**:2. 1888; Finl. Basidsv. 441. 1889; Sacc. Syll. Fung. **9**:244. 1891; Bresadola, Ann. Myc. **1**:108. 1903.

Tomentella cinerascens (Karst.) v. Höhnel & Litschauer, K. Akad. Wiss. Wien Sitzungsber. **115**:1570. 1906.

Type: authentic specimen in Burt Herb.

Fructification effused, byssoid, membranaceous, separable, drab-gray, the margin the same color or whitish; in structure 200–350μ thick, with the hyphae hyaline under the microscope, thin-walled, nodose-septate, loosely interwoven; basidia with 4 sterigmata; spores drab-gray in a spore collection, globose, echinulate, the body 4½–5½μ in diameter.

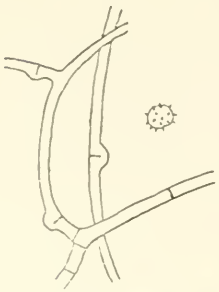

Fig. 24
H. cinerascens. Hyphae, spore×640.

Fructification 2–3 cm. long, 1–1½ cm. broad.

On bark of *Alnus*. New Hampshire and Montana. September.

This species is distinguished from *H. epigaeus* by drab-gray color, fructification easily separable from substratum, occurrence on wood, smaller and echinulate spores, and hyphae of smaller diameter and more uniformly interwoven.

Specimens examined:
Finland: Mustiala, *P. A. Karsten.*
New Hampshire: Chocorua, *W. G. Farlow, 17.*
Montana: Missoula, *J. R. Weir, 440* (in Mo. Bot. Gard. Herb., 22144).

25. H. peniophoroides Burt, n. sp.

Type: in Burt Herb. and in N. Y. Bot. Gard. Herb.

Fructification long and widely effused, coriaceous, compact, adnate, glabrous, pinkish buff, the margin entire, determinate; in structure 300–400μ thick, stratose, composed of fine interwoven hyphae and numerous cystidia; hyphae concolorous with the fructification, 1½μ in diameter, not nodose-septate, densely interwoven, dichotomously branched, and with antler-shaped hyphal branches especially noticeable at the surface of the hymenium; cystidia very numerous in all regions of fructification, cylindric, acute, 36–

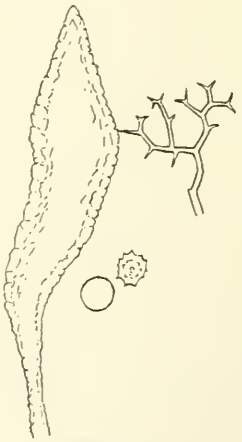

Fig. 25
H. peniophoroides. Cystidium, antler-shaped organ, spores×640.

60 × 12μ, emerging up to 25μ; basidia with 4 sterigmata; spores globose, becoming pinkish buff and tuberculate, the body 6μ in diameter.

Fructification more than 7 cm. long, more than 4 cm. broad.

On bark of rotten frondose wood in woods. Louisiana and Jamaica. September to November.

This species is included in *Hypochnus* on account of its mature spores, whose tubercules are short and small. The immature spores are hyaline and even; hence immature specimens of this species are likely to be referred to *Peniophora.* The presence in the hymenium of dichotomously branched, antler-shaped, hyphal branches such as are present in *Corticium investiens* and *Grandinia granulosa* is a unique character which I have not observed in any species of *Peniophora* and which should make possible identification of immature specimens. In habit, *H. peniophoroides* resembles *Corticium portentosum* and *Thelephora pallescens* Schw.

Specimens examined:

Louisiana: St. Martinville, *A. B. Langlois, v.*

Jamaica: Mooretown, *F. S. Earle,* type, N. Y. Bot. Gard., Plants of Jamaica, 540.

26. H. thelephoroides (Ell. & Ev.) Burt, n. comb.

Corticium thelephoroides Ellis & Everhart, Jour. Myc. **1**:88. 1885; Sacc. Syll. Fung. **6**:630. 1888.

Type: in N. Y. Bot. Gard. Herb., and portions in Kew Herb., Farlow Herb., and Mo. Bot. Gard. Herb.

Fructification effused, adnate, thick, compact, at first pale olive-buff, becoming warm buff in the herbarium, the under side and very narrow margin Saccardo's umber; in structure 150–1200μ thick, with (1) a densely interwoven layer about 60μ thick next to substratum and (2) with a hymenial layer composed of hyphae, antler-shaped hyphal branches, and numerous imbedded, concolorous spores; hyphae thick-walled, not nodose-septate, 1½–2μ

Fig. 26
H. thelephoroides. Antler-shaped organ, spore×640.

in diameter, honey-yellow under the microscope, forming in the interior of the layer and at the surface of the hymenium numerous dichotomously branched branches with subulate tips which resemble the antlers of a stag; basidia bearing 4 spores on sterigmata; basidiospores hyaline, or very nearly so, under the microscope, rough-walled or aculeate with very short points, globose, body 5–5½μ in diameter; imbedded spores honey-yellow under the microscope, even or rarely rough, 5–6μ in diameter.

Fructification 1–4 cm. long, ½–2 cm. broad, often in lobate, connected masses.

On fir logs. Washington and British Columbia. July.

The basidia of this species show best in the recent collection 120μ thick, from which the illustration has been made. The stage of the type is much thicker apparently by growth of great numbers of the antler-like hyphal branches which conceal the basidia. This species resembles closely in habit, structure, and spore characters *Thelephora pallescens* Schw. of eastern North America, except that the spores of *T. pallescens* show by magnification with a 1½-inch objective only rarely a minutely rough wall. *H. peniophoroides* differs by having cystidia.

Specimens examined:

Washington: *Carpenter, 90,* type (in N. Y. Bot. Gard. Herb., Kew Herb., and in Mo. Bot. Gard. Herb.).

British Columbia: Vancouver, *J. Macoun, v. 178,* comm. by J. Dearness, (in Mo. Bot. Gard. Herb., 8938).

27. H. zygodesmoides (Ellis) Burt, n. comb.

Thelephora zygodesmoides Ellis, N. Am. Fungi (Exsic.), 715. 1882; Cooke, Grevillea **20**:34. 1891; Sacc. Syll. Fung. **11**:117. 1895.

Type: Ellis, N. Am. Fungi, 715.

Fructification effused, thin, arachnoid-membranaceous, separable from the substratum, pinkish buff to cinnamon-buff and avellaneous, the margin of the same color, narrow, byssoid; in structure 200–400 μ thick, with some rope-like strands up to 15μ in diameter next to the substratum;

hyphae pinkish buff under the microscope, thin-walled, collapsing, not nodose-septate, very loosely interwoven, 3½–5μ in diameter; basidia clavate, 28 × 5μ, with 4 short sterigmata; spores with a slight tinge of buff in collection on slide but hyaline under the microscope, ovoid, uneven to echinulate, the body 5–6 × 4–4½μ.

Fig. 27
H. zygodesmoides. Spore, hypha×640.

Fructifications 2–3 cm. long, 1–2 cm. broad.

Under side of decaying pine logs. Quebec to New Jersey. August to January. Rare.

In this species a loose subiculum is present next to the wood and bears on its surface a delicate hymenium, suggesting in habit *Corticium arachnoideum* but colored. *Hypochnus zygodesmoides* is not as bright yellow as *H. echinosporus* and has paler spores than the latter and not globose.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 715, under the name *Thelephora zygodesmoides.*

Quebec: Ironsides, *J. Macoun, 266.*

Vermont: Middlebury, *E. A. Burt.*

New Jersey: Newfield, *J. B. Ellis,* type, in Ellis, N. Am. Fungi, 715.

28. H. echinosporus (Ellis) Burt, n. comb.

Corticium echinosporum Ellis, Torr. Bot. Club Bul. **8**:64. 1881; Sacc. Syll. Fung. **6**:633. 1888; Wakefield, Brit. Myc. Soc. Trans. **5**:129. 1915.

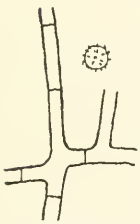

Fig. 28.
H. echinosporus. Hypha, spore ×640.

Type: in N. Y. Bot. Gard. Herb.

Fructification effused, membranaceous, separable, Naples-yellow to deep colonial buff, the margin concolorous, scanty, indeterminate; in structure 200μ thick, consisting of a thin, soft, hymenial membrane upon the loosely interwoven threads of the subiculum; hyphae concolorous (sometimes hyaline under the microscope), thin-walled, not nodose-septate, 3–4μ in diameter, lax, very loosely interwoven, suberect, branching towards the

outer end to form a membranous hymenium; no cystidia; basidia with 4 sterigmata; spores concolorous (sometimes hyaline under the microscope), globose, echinulate, the body 4–5μ in diameter.

Fructification 2–4 cm. long, 1–2 cm. broad.

On rotting pine wood and bark. Canada to Louisiana and in Oregon; occurs in Sweden also. August to December.

The distinguishing characters of *H. echinosporus* are its bright yellow fructifications of somewhat a straw-colored yellow, with hyphae and globose echinulate spores of the same color. Under the microscope this tint of yellow is not very intense and may be unnoticed, and regarded as hyaline. Bresadola[1] regards *Corticium echinosporum* as a synonym of *H. pellicula* Fr. (=*Corticium mollis* var *pellicula* Fr.). The specimen which Karsten has communicated to me as *Corticium pellicula* Fr. has even spores and incrusted hyphae and is a true *Corticium*. It seems best to regard *H. echinosporus* as valid until there is found an earlier name supported by an authentic specimen. It is only rarely possible to recognize resupinate species of the higher fungi from the descriptions alone of the earlier mycologists.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 608, under the name *Corticium echinosporum.*

Sweden: Stockholm, *L. Romell, 154.*

Quebec: Hull, *J. Macoun, 385.*

Ontario: Ottawa, *J. Macoun, 668.*

New York: Freeville, *G. F. Atkinson,* Bot. Dept. Cornell Univ., 3277; Ithaca, *G. F. Atkinson, 22762.*

New Jersey: Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 608.

Louisiana: Abita Springs, *A. B. Langlois, 2638.*

Oregon: Corvallis, *W. A. Murrill,* N. Y. Bot. Gard., Fungi of Oregon, 921, 922 (in N. Y. Bot. Gard. Herb. and in Mo. Bot. Gard. Herb., 5690 and 8937).

29. H. fibrillosus, Burt, n. sp.

Type: in Burt Herb.

[1]Ann. Myc. 1:107. 1903.

Fructification widely effused, thin, with surface a reticulate, felty web, perforate, not separable, between olive-buff and deep olive-buff; in structure 100–150μ thick, with hyphae thick-walled, nodose-septate, giving their color to the fructification but nearly hyaline under the microscope, 3–3½μ in diameter, minutely rough-walled near the substratum and sending out loosely interwoven branches which bear clusters of basidia; basidia 18 × 5μ, bearing 4 spores on short sterigmata; spores concolorous with the hyphae, angular, the body 3–3½ μ in diameter.

Fig. 29
H. fibrillosus.
Spores, hypha
×640.

The specimen, 6 cm. in diameter, is a portion of a large specimen and does not show the natural margin.

On very rotten coniferous wood. Canada. September.

This species has the general habit and color of *Corticium vagum* and is well characterized by its general habit, pale color, and small angular spores.

Specimens examined:

Canada: locality not stated, *J. Macoun, 25,* Sept. 29, 1892.

30. H. fumosus Fries, Obs. Myc. **2**:279. 1818 and 1824.

Corticium fumosum Fries, Epicr. 562. 1838; Hym. Eur. 651. 1874; Sacc. Syll. Fung. **6**:613. 1888. — *Phlebia vaga* Fries, Syst. Myc. **1**:428. 1821; Elenchus Fung. **1**:155. 1828; Epicr. 527. 1838; Hym. Eur. 625. 1874; Sacc. Syll. Fung. **6**:498. 1888; Bresadola, I. R. Accad. Agiati Atti III. **3**:105. 1897.— *Corticium sulphureum* Pers. Obs. Myc. **1**:38. 1796, but not *Corticium sulphureum* Fries. — *Odontia fusca* Cooke & Ellis, Grevillea **9**:103. 1881; Sacc. Syll. Fung. **6**:509. 1888.

Fig. 30
H. fumosus.
Spore×640.

Fructification effused, membranaceous, separable, with the outer surface more or less overrun with intricate, branching, anastomosing threads, then granular, honey-yellow to drab and fuscous, the margin whitish or yellowish, flaxy-fibrillose, radiating; in structure about 200μ, rarely up to 500μ, thick, with hyphae longitudinally interwoven, occasionally nodose-septate, 2½–3½μ in diameter, thin-walled, hyaline, or slightly smoky if the fructification is dark colored; no

cystidia; basidia with 4 sterigmata; spores white in collection on slide, ovoid, minutely echinulate with short crowded spines, spore body 3–5×2½–3½μ.

Fructifications 3–10 cm. long, 1½–4 cm. broad.

On rotten wood and bark of both coniferous and frondose species. Canada to North Carolina and westward to Washington, and in Jamaica. April to January. Common.

Collections of this species have been placed by recent authors in the genera *Corticium, Phlebia,* and *Odontia,* as an anomalous species which has no relationship to the species proper of these genera. The affinities of this fungus are with the species of *Hypochnus* by habit, dry hypochnoid structure, form of hymenial surface, and form of spore. The species is best regarded as a hyaline-spored *Hypochnus,* which is naturally connected with the dark-spored members of this genus by the pale-spored *H. echinosporus, H. zygodesmoides,* etc. The existence of an authentic specimen of *Hypochnus fumosus* is unknown to the writer, but this fungus is so distinguished among the species of *Thelephoraceae* that the lack of such a specimen is not serious in this case. Romell and Bresadola regard this fungus as the *H. fumosus* of Fries. My own study of the large series of Scandinavian *Thelephoraceae* received from Romell and Karsten leads me to the same conclusion.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 509; Ell. & Ev., Fungi Col., 1018, in both under the name *Odontia fusca.*

Sweden: Stockholm, *L. Romell, 96.*

Austria-Hungary: Tatra Magna, *V. Greschik,* two collections, comm. by G. Bresadola.

Canada: locality not stated, *J. Macoun, 27*; Lower St. Lawrence Valley, *J. Macoun, 23.*

New Brunswick: Campobello, *W. G. Farlow, 6.*

Ontario: Ottawa, *J. Macoun, 24;* Harraby, Lake Rosseau, *E. T. & S. A. Harper, 744.*

British Columbia: near Salmo, *J. R. Weir, 460, 528* (in Mo. Bot. Gard. Herb., 9207 and 22647 respectively).

New Hampshire: Chocorua, *W. G. Farlow, 3.*
Vermont: Middlebury, *E. A. Burt,* three collections.
Massachusetts: *W. G. Farlow* (in Farlow Herb.).
New York: Albany, *H. D. House & J. Rubinger* (in Mo. Bot. Gard. Herb., 6327); Alcove, *C. L. Shear, 1330;* Floodwood, *E. A. Burt,* four collections; Sylvan Beach, Oneida Co., *H. D. House* (in Mo. Bot. Gard. Herb., 7664); Karner, *H. D. House, 166, 168, 204* (in Mo. Bot. Gard. Herb., 44716, 44717, and 44725 respectively).
New Jersey: Belleplain, *C. L. Shear, 1252;* Newfield, *J. B. Ellis,* and also two specimens distributed in his exsiccati.
Maryland: Takoma Park, *C. L. Shear, 966.*
North Carolina: Blowing Rock, *G. F. Atkinson,* Bot. Dept. Cornell Univ., 4197.
Wisconsin: Lake Geneva, *E. T. & S. A. Harper, 898.*
Colorado: Portland Mine, Cripple Creek, *C. J. Humphrey, 7729.*
Montana: Evaro, *J. R. Weir, 423* (in Mo. Bot. Gard. Herb., 13273).
Idaho: Priest River, *J. R. Weir, 16, 22, 43.*
Washington: Bingen, *W. N. Suksdorf, 853.*
Jamaica: Monkey Hill, *W. A. Murrill,* N. Y. Bot. Gard., Fungi of Jamaica, 806.

31. H. aurantiacus (Pat.) Burt, n. comb.
Tomentella aurantiaca Patouillard, Soc. Myc. Fr. Bul. **24**:3. 1908.

Fructification obscure, aurantiacus; hyphae fuscous under the microscope, nodose-septate, 2–3μ in diameter; spores angular-globose, fuscous, 5–8μ in diameter.

On bark of trees. Guadeloupe.—Description overlooked until too late for insertion near *H. bicolor,* with which specimens should be compared.

Change of Name

Sebacina plumbea Burt, Mo. Bot. Gard. Ann. **2**.765. 1915, should be changed to *Sebacina plumbescens* Burt, for the former name is preoccupied by *Sebacina plumbea* Bres., which is not the same species.

(To be continued.)

The Thelephoraceae of North America. VII

Septobasidium

EDWARD ANGUS BURT

Reprinted from ANNALS OF THE MISSOURI BOTANICAL GARDEN 3:319–343. September, 1916

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THE THELEPHORACEAE OF NORTH AMERICA. VII[1]

Septobasidium

EDWARD ANGUS BURT

Mycologist and Librarian to the Missouri Botanical Garden
Associate Professor in the Henry Shaw School of Botany of Washington University

SEPTOBASIDIUM

Septobasidium Patouillard, Jour. de Bot. **6**:61. *textf.* 1892; Essai Taxon. Hym. 7. 1900; Sacc. Syll. Fung. **11**:118. 1895; *ibid.* **14**:215. 1900; *ibid.* **16**:184. 1902; *ibid.* **17**:203. 1905; *ibid.* **21**:445. 1913. — *Jola* Möller, A., Bot. Mitth. a. d. Tropfen **8**, Protobasidiomyceten 22–29. *pl. 4. f. 4.* 1895; Engl. & Prantl, Nat. Pflanzenfam. **I.1****:84. 1897; Sacc. Syll. Fung. **14**:245. 1900.

The genus was founded upon *Septobasidium pedicellatum* Pat. and *Septobasidium velutinum* Pat.

Fructifications resupinate, effused, coriaceous, producing probasidia upon the hyphae at or near the hymenial surface; the probasidia remain attached to the hyphae and either produce at the apex a few-celled, hyaline, spore-bearing filament, or elongate, become septate, and differentiate into such a filament, usually termed a transversely septate basidium; spores simple, hyaline, even, borne one to each cell by the terminal cell and next lower cells.

The spores are apparently produced in succession upon the spore-bearing organ rather than simultaneously, for in only two instances have I observed two spores present at the same time upon the same organ; in these the two spores were very unequal in size. One sees a spore attached to the terminal cell more frequently than to lower cells but perhaps

Note.—Explanation in regard to the citation of specimens studied is given in Part VI, Ann. Mo. Bot. Gard. 3:208, footnote. The technical color terms used in this work are those of Ridgway, Color Standards and Nomenclature. Washington, D. C., 1912.

[1]Issued November 4, 1916.

because of the more favorable position of the terminal cell. I have frequently observed a spore attached to some one or other of the upper three cells of the spore-bearing organ but have seen such attachment to the fourth cell only in *S. castaneum,* although often noting on the fourth cell in some species a lateral protuberance similar to those to which spores were attached in the upper cells. The spore-bearing stage is apparently of very brief duration, judging by the few collections which show this stage well. Specimens are usually collected sterile or with probasidia. It is hoped that the record given as to the month when each of our species has been collected in spore-bearing condition may aid in securing more valuable specimens for study in the future.

Septobasidium is not one of the genera of the *Thelephoraceae,* for its spore-producing organs are not simple basidia. The genus is treated here merely for the convenience of students of the *Thelephoraceae,* as in the case of *Tremellodendron, Eichleriella,* and *Sebacina.* The coriaceous structure and resupinate habit of the species of *Septobasidium* are so similar to those of *Corticium* and other resupinate genera of the *Thelephoraceae* that examination by the microscope of sections of the fructification is necessary to distinguish an unfamiliar species of *Septobasidium* from *Corticium,* etc. Many of the known species of *Septobasidium* were originally published as Corticiums and Thelephoras, and it is probable that careful study of authentic specimens of the earlier species of these genera will lead to the transfer of additional species to *Septobasidium.* It is possible that some authors may have mistaken the pyriform to globose probasidia of species of *Septobasidium* for conidia and have published such species as *Hyphomycetes.* The probasidia may be distinguished from hyphomycetous spores by the former bodies remaining attached to the hyphae; the probasidia do not float about loose in preparations.

I am indebted to Dr. R. P. Burke for transmitting to me in fresh condition spore-bearing material of three species of *Septobasidium.* Spore falls were obtained from this material for germination experiments and some material was

fixed and preserved for a cytological study of *Septobasidium* during spore production. Discussion of the systematic relationships of *Septobasidium* may well await the completion of such study.

The species of *Septobasidium* are tropical or subtropical. Extreme northern stations, based on specimens examined by the writer, are London, Ontario, Canada, and Madison, Wisconsin—both are stations for *S. pseudopedicellatum,* which is the most frequent species of the United States.

With regard to the biology of *Septobasidium,* several specimens of this genus—usually of *S. pseudopedicellatum*—have been noted by their respective collectors as occurring especially on plants badly affected by scale insects. Other specimens show scale insects numerous about the fructification and overrun by it. Petch [1] in a note on the biology of *Septobasidium* states that from examination of a long series of specimens, it has been determined that these fungi are parasitic on colonies of scale insects which they overgrow and destroy completely, and that these fungi live, not on secretions of the insects, but upon the insects themselves.

In addition to independent observations on the association of *Septobasidium* with scale insects, other facts tending to show an entomogenous adaptation of *Septobasidium* are the following:

(1) All species of *Septobasidium* known to the writer occur only on living branches or leaves, and in no instance has there been penetration by the fungus through the epidermis or bark into the living tissues of the substratum, or any injury or deformation or gall response by the branch or leaf.

(2) Spores are produced by *S. pseudopedicellatum,* in the region from North Carolina and Alabama to Porto Rico, in May when young colonies of the scale insects are forming. Mr. Seagle wrote to me that the old fructifications of *S. pseudopedicellatum* disappear from his apple trees in North Carolina in late spring and in early summer, and new fruc-

[1] Ann. Bot. 25:843. 1911.

tifications grow which become large by early winter. The collections which I have studied, made during fall and early winter, have been in vegetative rather than in fruiting stage.

On the other hand, some specimens of *Septobasidium* in herbaria have no scale insects on the portions of twigs bearing the fructifications of *Septobasidium,* but I can not say as to whether these fructifications made their start on clean twigs or on scattered scale insects which they have completely overgrown and destroyed.

KEY TO THE SPECIES

Fructification having the hymenial layer or membrane raised above the substratum and supported on scattered pillars composed of parallel hyphae close together side by side 1

Fructification having the hymenial layer supported on pillars but with the pillars less regular in form than in the above and composed of loosely interwoven and curving hyphae. Known from Cuba.....*10. S. cirratum*

Fructification lacking supporting hyphal pillars, with hyphae extending from substratum to the hymenial region without noteworthy consolidation 5

1. With erect or suberect paraphyses or hyphal branches at the surface of the hymenium 2

1. With surface of hymenium composed of longitudinally arranged and interwoven paraphyses or hyphal branches..... 3

1. Structure of surface of hymenium not published; probasidia 20×15–20μ, persistent at the base of the spore-bearing organs; spore-bearing organs horseshoe-shaped, 35×10μ. In Cuba .....*1. S. pedicellatum*

1. Structure of surface of hymenium not published; fructification black, shining, very thin. In Guadeloupe. .....*9. S. atratum*

2. Fructification ⅛–½ mm. thick; probasidia 12×7–9μ; spore-bearing organs 20–25×4½–5μ .....*2. S. Schweinitzii*

2. Fructification 1–1½ mm. thick; probasidia 26×11μ; spore-bearing organs hook-shaped, up to 50×8μ. In Mexico .....*3. S. tropicale*

2. Fructification 1–1½ mm. thick; probasidia 13–25×10–13μ; spore-bearing organs straight, up to 60×11μ; spores 13×5½μ. In Jamaica.... .....*8. S. jamaicaense*

2. Fructification not shining, velutinous, aniline-black, becoming fuscous in the herbarium; probasidia 15–20μ in diameter .....*7. S. Patouillardii*

3. Fructification glabrous, shining..... 4

4. Varying from avellaneous and wood-brown to cinnamon-brown; probasidia 12–20×8–15μ; spores 17–22×4–5μ ....*4. S. pseudopedicellatum*

4. Vandyke brown when in vegetative condition, olive-brown when fertile; probasidia 11–15×9–10μ; spores 12×3–3½ μ .....*5. S. castaneum*

4. Olive-brown darkening to dark neutral gray; probasidia and spores unknown. In Nicaragua. .....*6. S. sublilacinum*

5. Fructification divided into many narrow, sinuous divisions, better shown toward the margin 6

5. Fructification not divided but with surface reticulated with obtuse veins; at first drab or Prout's brown then Chaetura-drab.....*13. S. retiforme*

5. Fructification neither divided nor veined 7

6. Plumbeous when bright colored, often smoke-gray or pallid mouse-gray, velutinous ..... *11. S. Langloisii*

6. Honey-yellow to old gold, velutinous ..... *12. S. frustulosum*

7. Hymenial crust glabrous, between mouse-gray and hair-brown; middle region spongy, lacunose; fructification 1½–2 mm. thick. In Cuba..... ..... *14. S. Spongia*

7. Fructification tomentose, between mouse-gray and hair-brown; probasidia 12–15μ in diameter; spores 12–15×5–6μ..... *15. S. fumigatum*

7. Fructification pubescent, white at first, pale olive-buff in the herbarium; probasidia 15–17μ in diameter; spores 15–20×5½–6μ. In California.... ..... *16. S. canescens*

7. Fructification velutinous, between lilac-gray and pallid smoke-gray; probasidia up to 9μ in diameter; spores 11–13×3½–4½μ. In Trinidad..... ..... *17. S. lilacinum*

1. Septobasidium pedicellatum Patouillard, Jour. de Bot. 6:61. *textf.* 1892.

Thelephora pedicellata of C. Wright's Cuban Exsiccati, but not of Schweinitz.

Type: in Museum of Paris.

Fructification with pillars or pedicels composed of hyphae which branch towards the upper end and pass into and support the hymenial crust; probasidia subglobose, 20 × 15–20μ, arising as lateral outgrowths near the ends of the final branches of the hyphae, producing from the apex a hyaline, cylindric, spore-bearing organ, 35 × 10μ, 2–3-septate, which becomes horseshoe-shaped, slightly constricted at the septa, and has a small protruberance on the convex side of each cell; no spores seen.

The above is a summary of the account by Patouillard,[1] of the structure of the specimen in the Museum of Paris, collected in Cuba by C. Wright and distributed by him in his Cuban exsiccati under the name *Thelephora pedicellata.* Wright made two collections in Cuba which were determined by Berkeley and Curtis[2] as *Thelephora pedicellata.* Since Patouillard omitted the data on the label of the specimen which he studied, I do not know now which of Wright's numbers is the type collection and have to defer a fuller consideration of this species to the supplement to my monograph.

[1] *Loc. cit.*

[2] Linn. Soc. Bot. Jour. 10:329. 1868.

2. **S. Schweinitzii** Burt, n. sp.

Thelephora pedicellata Schweinitz, Naturforsch. Ges. Leipzig Schrift. **1**:108. *pl. 2. f. 3.* 1822; Fries, Elenchus Fung. **1**:200. 1828; Epicr. 544. 1838; Sacc. Syll. Fung. **6**:544. 1888. Not *Septobasidium pedicellatum* Pat.

Illustrations: Schweinitz, *loc. cit.*

Type: in Herb. Schweinitz.

Fructification resupinate, coriaceous, dry, not separable from the substratum, varying from drab and cinnamon-drab to wood-brown, the margin undulate, whitish; in structure 3-layered, with (1) a layer next to the substratum of densely interwoven, colored hyphae 3–3½μ in diameter, which form (2) a layer of erect hyphal pillars or pedicels each about 200–300μ long, 40–75μ in diameter, about 2 to a millimeter, and pass into and support at the outer end (3) the hymenial layer 120–200μ thick, composed of densely interwoven, colored hyphae 3–3½μ in diameter, of erect, flexuous, filiform, sparingly branched, hyaline paraphyses or hyphal branches about 1½μ in diameter, and, when in fertile stage, of hyaline, thin-walled, erect probasidia, pyriform to subglobose, 12 × 7–9μ in the type, borne on the colored hyphae; spores simple, hyaline, even, curved, 5 × 2½μ (as seen attached in the type but perhaps immature), borne singly at the apex of the terminal cell of a short filament 20–25 × 4½–5μ, about 4 cells long, curved to fish-hook-shaped in form, which develops from the probasidium.

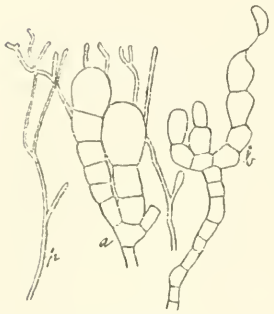

Fig. 1
S. Schweinitzii.
a, portion of hymenium showing paraphyses and two probasidia; *b*, spore-bearing organ and spore; *p*, paraphysis. × 640.

Fructifications 2 – several cm. long, 1 – several cm. broad, ⅓–½ mm. thick.

On living branches. North Carolina to Louisiana. Frequent in winter.

The above description is based on the Schweinitzian type and presents the characters of a rare species which has not been distinguished heretofore from the following *S. pseudopedicellatum,* a thicker, larger, common, and widely distributed species. *S. Schweinitzii* is characterized by its erect filiform paraphyses, curved to hook-shaped, spore-bearing organs, and small spores, although it is not certain that full-sized mature spores have yet been seen.

I refer to *S. Schweinitzii* a collection made by P. L. Ricker on *Persea,* in Georgia, during August, because this specimen has small probasidia, hook-shaped, few-celled, hyaline, spore-bearing organs, and spores 7 × 3½μ; but in this specimen only a few paraphyses are present, the probasidia and hook-shaped organs are at the very surface of the hymenium, and small, globose organs 5μ in diameter are occasionally present, borne laterally on the hyphae in the lower part of the hymenial layer. I have not studied with the microscope the Cuban specimen of *S. pedicellatum,* collected by C. Wright, one of the species upon the structure of which Patouillard founded the genus *Septobasidium.* He found this specimen to have probasidia and hook-shaped organs. Both probasidia and the hyaline organs are described as larger than they measure in the Schweinitzian type. In the Cuban specimen the probasidia are stated to be 20μ in diameter or 20 × 15μ, and the hook-shaped organs as 35 × 10μ, and the former persist full size, with the septate hook-shaped organs connected with them like a promycelium with its teleutospore. These differences indicate that the Cuban specimen belongs to a species distinct from *Thelephora pedicellata* Schw. It is necessary to substitute a new specific name for "pedicellata" in making the transfer of *Thelephora pedicellata* Schw. to *Septobasidium,* because there is already a valid *Septobasidium pedicellatum.*

Specimens examined:

North Carolina: *Schweinitz,* type (in Herb. Schw.).

Georgia: Bugaboo Island, Okeefenokee Swamp, *P. L. Ricker, 921.*

Louisiana: Gibson, *F. T. McLean*, comm. by P. Spaulding.

3. **S. tropicale** Burt, n. sp.

Type: in Mo. Bot. Gard. Herb. and in Farlow Herb.

Fructification resupinate, effused, coriaceous, dry, not separable from substratum, glabrous, not shining, avellaneous, the margin concolorous, squamulose-fimbriate, not closely adnate; in structure 3-layered, with (1) a layer next to the substratum of densely interwoven, concolorous, thick-walled hyphae 3–3½μ in diameter, which pass into and form (2) a layer of numerous erect, slender pillars about 40μ in diameter, 5 or 6 to the millimeter, whose hyphae spread apart at the outer end, branch, and form and support (3) the hymenial crust about 200μ thick, densely interwoven throughout, with the even, thick-walled, colored hyphae up to 6μ in diameter on the under side, more erect, paler, and about 2μ in diameter at the surface; probasidia terminal on the hyphae, hyaline or but slightly colored, pyriform, 26 × 11μ, at the surface of the hymenium; a spore partially imbedded in the hymenium is hyaline, simple, even, curved, 19 × 6μ, no others seen; fish-hook-shaped organs, such as probably bear the spores, are present in the surface of the hymenium, several-celled, up to 50 × 8μ, with prominent protuberances from cells on the convex side of the organ.

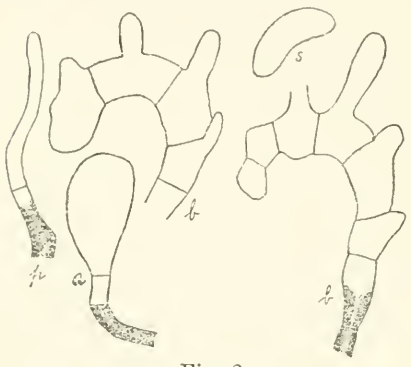

Fig. 2
S. tropicale.
a, probasidium; *b*, two spore-bearing organs; *s*, spore; *p*, paraphysis. × 640.

Fructification 4 cm. long, about 2 cm. broad, 1–1½ mm. thick.

On bark of living branches of *Quercus*. Mexico.

The distinctive characters of this species are avellaneous color, surface not shining, margin squamulose-fimbriate, not closely adnate as in the preceding species, and thicker hy-

menial crust not loosely interwoven on its under sides, probasidia terminal on the hyphae, and the large hook-shaped, presumably spore-bearing, organs of the upper surface. If these organs grow out from the probasidia, the probasidium must differentiate into the organ, for I have traced the curved organ back to the colored hyphal cells.

Specimens examined:

Mexico: locality not stated, *C. G. Pringle*, comm. by W. G. Farlow, 5 (in Mo. Bot. Gard. Herb., 44590).

4. S. pseudopedicellatum Burt, n. sp.

Thelephora pedicellata of most American authors but not of Schweinitz.

Type: in Mo. Bot. Gard. Herb.

Fructification resupinate, effused, coriaceous, dry, not separable from the substratum, varying from avellaneous and

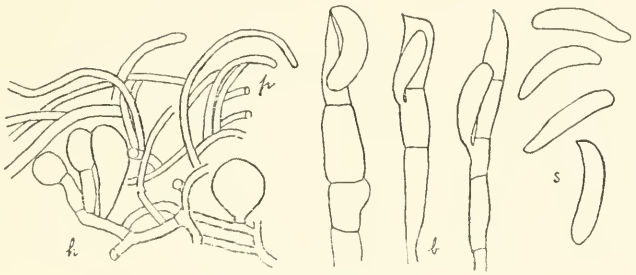

Fig. 3

S. pseudopedicellatum.

h, portion of hymenium showing the longitudinally interwoven hyphal ends or paraphyses and some probasidia; *b*, three spore-bearing organs; *s*, spores. × 640.

wood-brown to cinnamon-brown, the margin undulate, whitish; in structure three-layered, with (1) a layer next to the substratum of densely interwoven, thick-walled, slightly colored hyphae 3μ in diameter, which form (2) a layer of erect, hyphal pillars, or pedicels, each about 500μ long, 20–40μ in diameter, about 3–5 to a millimeter, whose hyphae spread apart at the upper end of the pillars, branch, and form and support (3) the hymenial crust about 300μ thick, with hyphae loosely interwoven near the pillars, 3–3½μ in

diameter, very dense at the outer surface with the hyphal branches or paraphyses 2μ in diameter, curved longitudinally along the surface and densely interwoven; erect probasidia nearly hyaline, rich in protoplasm, deeply staining, pyriform, 12–20 $\times$ 8–15μ, are borne laterally on the hyphae about 15μ below the surface of the hymenium; spores white in a spore collection, simple, even, curved, 17–22 $\times$ 4–5μ, are borne singly from each of the upper three cells (so far as observed) of a straight or flexuous, few-celled, hyaline organ up to 60 $\times$ 5–5½μ, which grows from the probasidium and protrudes above the surface of the hymenium.

Fructifications 2–15 cm. long, 1–8 cm. broad, 1–1½ mm. thick.

On small, living branches of apple, orange, oak, *Nyssa, Cornus, Liquidambar,* and also on orange leaves in one collection; sometimes, perhaps always, associated with scale insects. Canada to Florida and Louisiana and westward to Wisconsin; also in Cuba and Porto Rico. December to August; spores produced in the last of May.

S. pseudopedicellatum is the common *Septobasidium* of southeastern United States. It may be recognized by its brown, glabrous, shining, foliaceous crust which is raised and supported about a millimeter above the substratum on perpendicular, hyphal pillars which are as conspicuous as the rhizoids of a lichen. Old specimens may crack, break the hyphal pillars, and the hymenial crust curl outward so as to show the broken pillars attached to the under side. Sterile specimens of this species have been heretofore referred to *S. pedicellatum,* but a collection of fertile specimens received from Dr. R. P. Burke in May of the present year shows that our common species differs from *S. pedicellatum* by having large spores produced on a straight or but slightly curved, much larger, spore-bearing organ, paraphyses or hyphal branches at the surface of the hymenium curved and densely longitudinally interwoven, larger probasidia, and larger and thicker fructifications. Even in sterile condition the longitudinally interwoven paraphyses are sufficiently distinctive.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 12, under the name *Thelephora pedicellata.*

Canada: Ontario, London, *J. Dearness, 3396* (in Mo. Bot. Gard. Herb., 43802).

New Jersey: Newfield, *J. B. Ellis;* also from same locality in Ellis, N. Am. Fungi, 12.

Pennsylvania: Trexlertown, *W. Herbst,* comm. by Lloyd Herb., 2232.

North Carolina: Reepsville, *J. P. Seagle,* two collections, one of which was communicated by F. L. Stevens.

Florida: *W. W. Calkins;* Daytona, *R. Thaxter, 75a* (in Farlow Herb. and in Mo. Bot. Gard. Herb., 43894); Kissimmee, comm. by F. C. Wolf (in Mo. Bot. Gard. Herb., 44205); same locality, *B. E. Evans* (in Mo. Bot. Gard. Herb., 44403); Ft. Myers, *H. S. Fawcett* (in Fawcett Herb.); Gainesville, *H. E. Stevens,* comm. by E. Bartholomew, 40b (in Mo. Bot. Gard. Herb., 44212).

Alabama: *Peters, 75* (in Curtis Herb.); *F. S. Earle & C. F. Baker* (in Lloyd Herb., 3454); Auburn, *Alabama Biological Survey;* Montgomery, *R. P. Burke, 49,* and the type collection (in Mo. Bot. Gard. Herb., 10979, and 20659, type).

Louisiana: Gibson, *F. T. McLean,* comm. by P. Spaulding; St. Martinville, *A. B. Langlois,* three collections, two of which are (in Lloyd Herb., 2411, 3533).

Kentucky: comm. by A. H. Gilbert (in Mo. Bot. Gard. Herb., 44323); "in mountains," *P. Garman* (in Mo. Bot. Gard. Herb., 44302).

Wisconsin: Madison, *W. Trelease* (in Mo. Bot. Gard. Herb., 5164).

Cuba: Ceballos, *H. S. Fawcett, 10, 39* (in Mo. Bot. Gard. Herb., 15005, 15018); Isle of Pines, *H. S. Fawcett, 15* (in Mo. Bot. Gard. Herb., 15094).

Porto Rico: Mayaguez, *F. S. Earle, 79,* N. Y. Bot. Gard. Herb.

5. **S. castaneum** Burt, n. sp.

Type: in Mo. Bot. Gard. Herb.

Fructification resupinate, effused, coriaceous, dry, not separable from the substratum, glabrous, cracking in drying into pieces about 10 × 5 mm., olive-brown when fertile, Vandyke brown when in vegetative condition, the margin concolorous; in structure 3-layered, with (1) a layer next to substratum of opaque, concolorous hyphae 4μ in diameter, which form (2) a layer of pillared or spongy structure, in some places with pillars up to 150μ in diameter, about 1 mm. apart, and in other places with a spongy mass of obliquely ascending, interwoven hyphae similar to those of the pillars. This layer supports (3) the hymenial crust, sometimes stratose, with hyphae loosely interwoven on the under side, 3–4μ in diameter, very dense at the outer surface, with the hyphal branches or paraphyses 2μ in diameter, curved longitudinally along the surface and densely interwoven; erect probasidia slightly colored, rich in protoplasm, deeply staining, pyriform, 11–15 × 9–10μ, are borne laterally on the hyphae about 15μ below the surface of the hymenium; spores hyaline, simple, even, curved, 12 × 3–3½μ, borne singly from each of the upper four cells of a straight, few-celled, even-walled, clavate, hyaline organ 30–40 × 6μ, which grows from the probasidium and protrudes above the surface of the hymenium.

Fig. 4
S. castaneum.
a, two probasidia, one persistent at base of the spore-bearing organ which grows from it; *b*, six spore-bearing organs; *s*, spores. × 640.

Fructification 8–15 cm. long, wholly surrounding limbs 2½ cm. in diameter, 1–1½ mm. thick.

On living bark in swamp, Montgomery, Alabama. May and August—fertile in May.

This species is closely related to *S. pseudopedicellatum* but is more deeply colored, has more opaque hyphae, and smaller spores and spore-bearing organs. No lateral protuberances or papillae have been observed on the latter.

Specimens examined:

Alabama: Montgomery, *R. P. Burke,* two collections (in Mo. Bot. Gard. Herb., 20421, type, and 20693).

6. **S. sublilacinum** (Ellis & Ev.) Burt, n. comb.

Thelephora sublilacina Ellis & Ev. State Univ. Iowa, Lab. Nat. Sci. Bul. **13**:67. 1896; Sacc. Syll. Fung. **14**:214. 1900.

Type: in N. Y. Bot. Gard. Herb.

Fructification resupinate, effused, coriaceous, dry, not separable from the substratum, glabrous, shining, olive-brown, darkening to dark neutral gray; in structure 3-layered, with (1) a layer next to the substratum, 40–60μ thick, of closely crowded, longitudinally arranged hyphae concolorous with the fructification, 4–4½μ in diameter, which form (2) a layer of pillars 40–60μ in diameter, about 2–4 to a millimeter, whose hyphae spread apart at the outer end and form and support (3) the hymenial crust about 60μ thick, densely interwoven throughout, with even, thick-walled, concolorous hyphae 3–3½μ in diameter on the under side, 2μ in diameter, nearly hyaline, and densely, longitudinally interwoven at the surface; probasidia, spores or other organs not present in the type.

Fructification about ½ cm. in diameter, ¾ mm. thick.

On living branches. Nicaragua.

The type specimen of this species, when viewed from above, agrees so closely with the cotype of *S. Spongia* in color and habit that one is strongly disposed to regard the two specimens as of the same species. *S. sublilacinum* has, however, the coarser hyphae, a three-layered structure, and distinct pillars. It seems best to regard it as a distinct species, at least until fertile specimens define the species more definitely.

Specimens examined:

Nicaragua: *C. L. Smith, 108,* type (in N. Y. Bot. Gard. Herb.).

7. **S. Patouillardii** Burt, n. sp.

S. (very near) *Leprieurii* (Mont.) Patouillard, Soc. Myc. Fr. Bul. 16:55. 1900.

Type: in Burt Herb.

Fructification resupinate, effused, coriaceous, dry, velutinous, aniline-black at first, becoming fuscous in the herbarium, the margin rather thick and determinate; in structure 200–400μ thick, with (1) next to the substratum a thin layer of loosely interwoven hyphae 3μ in diameter, buffy brown under the microscope, which form (2) a layer of hyphal pillars each about 30–50μ in diameter, 100–200μ long, about 3–4 to a millimeter, whose hyphae spread apart above and form (3) the interwoven hymenial layer containing some probasidia and with the surface composed of numerous erect, nearly straight, fuscous hyphal branches or paraphyses 2μ in diameter; probasidia hyaline, subglobose, 15–20μ in diameter, erect on short branches of the colored hyphae; no spores found; the only possible spore-bearing organ seen is 46 × 7½μ, acuminate at the apex.

Fig. 5
S. Patouillardii. *a*. two probasidia; *b*, spore-bearing organ; *p*, four paraphyses or hyphal ends. × 640.

Fructifications 2–3½ cm. long, 1–2 cm. broad, 200–400 mm. thick.

On living branches of ash, *Liquidambar,* and *Nyssa.* Florida to Louisiana. November to March; a January collection has a few probasidia.

This species may be recognized by its thin fructification resembling a piece of black velvet, slightly raised from the substratum on such short and slender pillars as to be barely visible without the aid of a lens. Patouillard determined this species for Mr. Langlois as very near to *S. Leprieurii.* Since *Corticium Leprieurii* was originally described as glabrous, shining, and chocolate-colored, and since no specimens like ours have yet been collected in the region between Guiana and the United States, our specimens are probably a distinct species which should have a definite name.

Specimens examined:

Florida: Daytona, *R. Thaxter, 75b* (in Farlow Herb. and Mo. Bot. Gard. Herb., 43895).

Alabama: Auburn, *F. S. Earle & C. F. Baker,* also (in Mo. Bot. Gard. Herb., 5165).

Louisiana: St. Martinville, *A. B. Langlois, 3005,* determined by Patouillard as *S.* (very near) *Leprieurii;* Gibson, *F. T. McLean,* comm. by P. Spaulding, type—some fragments near a specimen of another species, but having probasidia, etc., as drawn, taken as the type because more mature than other collections cited.

8. **S. jamaicaense** Burt, n. sp.

Type: in Burt Herb. and N. Y. Bot. Gard. Herb.

Fructification resupinate, effused, coriaceous, spongy, dry, thick, bister, with the subiculum bone-brown; in structure with (1) next to the substratum a thin layer of interwoven hyphae which form (2) a layer of probably oblique, weak, very slender, crowded, hyphal pillars 12–20μ in diameter, up to 2000μ long, with hyphae even, 4–5μ in diameter, buffy brown under the microscope, diverging above to form (3) a spongy hymenial layer 300–400μ thick, with hyphae which rise obliquely, are loosely interwoven, and bear probasidia laterally at the outer surface of the layer and terminate in hyaline or subhyaline, curved branches or tips; probasidia hyaline, subglobose or pyriform, 13–25 $\times$ 10–13μ, quickly developing into hyaline, straight, few-celled, spore-bearing organs up to 60 $\times$ 11μ; spores simple, hyaline, slightly curved, 13 $\times$ 5½μ.

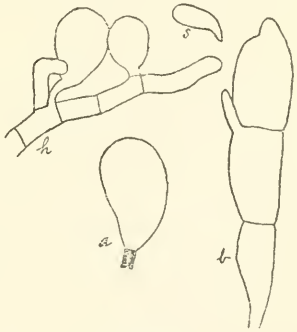

Fig. 6
S. jamaicaense.
h, hyphal end bearing two probasidia in the surface of the hymenium; *a*, probasidium; *b*, spore-bearing organ; *s*, spore. ×640.

Fructification larger than 6 cm. long, 2 cm. broad, 1–1½ mm. thick—fractured on all sides and not showing natural margin.

On bark. Base of John Crow Peak, altitude 5500 feet. Jamaica. April.

The type of this species has so thick and spongy a hymenial layer that I have tried to regard this specimen as the fertile stage of *S. Spongia,* but the well-developed layer of pillars is in the way of such reference and the hyphae are rather coarser than in *S. Spongia.*

Specimens examined:

Jamaica: John Crow Peak, *L. M. Underwood, 2439.*

9. **S. atratum** Patouillard, Soc. Myc. Fr. Bul. **16**:181. 1900.

Type: location unknown.

Fructification resupinate, greatly extended, glabrous, shining, thin, with the margin fimbriate and incrusting; subiculum black, formed of rigid, erect, short bundles composed of hyphae but little branched, 4–5μ in diameter, with the wall thick and brown under the microscope; hymenial crust thin, fragile, continuous, glabrous, ombre noir, paler at the periphery; probasidia at first globose, 10–12μ in diameter, growing on the sides of erect hyphae of the hymenial crust a little below their ends; spores and spore-bearing organs not present.

On living trunk of *Eugenia Jambos.* Morne Gommier, near Galion, Guadeloupe. *P. Duss.*

In connection with the original description, Patouillard stated that *S. Spongia* is "epais, roux, spongieux, lacuneux," and that *S. atratum* is "tres mince, et noir." I have seen no specimens of *S. atratum* and base the above account of this species wholly on the original description.

10. **S. cirratum** Burt, n. sp.

Type: in Mo. Bot. Gard. Herb. and Humphrey Herb.

Fructification resupinate, effused, coriaceous, spongy, dry, cracked, velutinous, between Benzo-brown and brownish drab, with fuscous subiculum, the margin divided into narrow, sinuous divisions; in structure up to 700μ thick, with (1) next to the substratum a layer of interwoven hyphae, which form (2) a layer of pillars not uniform in diameter, composed of hyphae loosely interwoven, curled together,

suggestive of ringlets in sectional preparations, which support (3) the hymenial layer 200–300μ thick, with hyphae 2–2½μ in diameter, notably curved, branched, and loosely interwoven, olive-brown under the microscope, bearing in the lower part of the layer numerous concolorous, globose bodies 11μ in diameter, and toward the outer surface hyaline probasidia 11μ in diameter also, and terminating at the surface in fine, hyaline branches 1μ in diameter, with recurved or coiled tips; spores simple, hyaline, even, curved, 18 × 6μ; spore-bearing organs few-celled, straight, cylindric, about 35–40 × 7½μ, differentiating from the probasidia.

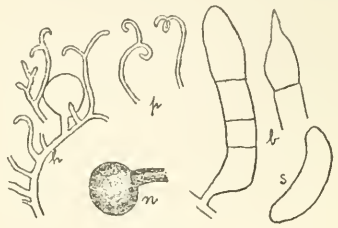

Fig. 7
S. cirratum.
h, portion of hymenium showing hypha bearing paraphyses and a probasidium; *b*, spore-bearing organs; *n*, colored body from deeper portion of hymenial layer; *p*, two paraphyses; *s*, spore. × 640.

Fructifications 5 cm. long, 1½ cm. broad.

On trunk of living hardwood tree near the base. Cuba. December. Seen but once by the collector.

S. cirratum has so nearly the color and habit of *Hypochnus fuscus* that it was a surprise to find the specimen a *Septobasidium*. The color and sinuously divided margin suggest *S. Langloisii*. The pillars composed of loosely interwoven and curving hyphae are unique and separate this species sharply from all our species of the *S. pedicellatum* group. The hyphae are too fine and too curving for *S. Spongia*.

Specimens examined:

Cuba: Omaja, *C. J. Humphrey, 2773* (in Mo. Bot. Gard. Herb., 15836).

11. S. Langloisii Patouillard, Soc. Myc. Fr. Bul. **16**:54. 1900.

Type: a portion in Burt Herb.

Fructification resupinate, effused, dry, velutinous, plumbeous when bright colored, but often smoke-gray or pallid mouse-gray, repeatedly divided into many narrow, sinuous

divisions which are more distinct towards the margin; in structure 200–250μ thick, with hyphae fuscous under the microscope, thick-walled, even, loosely interwoven from substratum to hymenium, densely interwoven in the hymenium and bearing hyaline, flexuous, suberect terminal branches or paraphyses and hyaline probasidia which are exceeded by the paraphyses; spores hyaline, simple, even, slightly curved, 15–21 × 5–7½μ, apparently produced singly at the apex of a nearly straight, 2–3-celled, spore-bearing organ into which the probasidium develops.

Fig. 8
S. Langloisii.
a, probasidium forming a spore-bearing organ; *b*, two spore-bearing organs; *p*, paraphyses; *s*, spores. × 640.

Fructification up to 5 cm. long, 2½ cm. broad, ¼ mm. thick.

On bark of living branches of *Crataegus, Carpinus,* and water oak. Florida to Louisiana and in Grenada. November to May.

This species resembles *S. frustulosum* in having the fructification divided into narrow sinuous divisions and differs from that species in being blue colored, verging into smoke-gray or paler in some specimens, instead of honey-yellow. The specimen from Grenada is thinner than those from other localities.

Specimens examined:

Exsiccati: Ravenel, Fungi Am., 450, under the name *Stereum pruinatum.*

Florida: Gainesville, *H. E. Stevens,* comm. by E. Bartholomew, 40a (in Mo. Bot. Gard. Herb., 44211); same locality, *Ravenel,* in Ravenel, Fungi Am., 450.

Alabama: Montgomery, *R. P. Burke, 52* (in Mo. Bot. Gard. Herb., 9558).

Louisiana: St. Martinville, *A. B. Langlois, 2995,* type.

Grenada: Grand Etang, *R. Thaxter,* comm. by W. G. Farlow, a (in Mo. Bot. Gard. Herb., 43912).

12. S. frustulosum (Berk. & Curtis) Patouillard, Soc. Myc. Fr. Bul. **10**:79. *pl. 3. f. 4.* 1894.

Hymenochaete frustulosa Berk. & Curtis, Linn. Soc. Bot. Jour. **10**:334. 1868; Sacc. Syll. Fung. **6**:601. 1888.

Illustrations: Patouillard, *loc. cit.*

Type: type and cotype in Kew Herb. and Curtis Herb.

Fructification resupinate, effused, coriaceous, dry, velutinous, honey-yellow to old gold, repeatedly divided into many narrow, sinuous, reticulate divisions which are more distinct towards the margin; in structure about 600–700μ thick, 3-layered, with next to the substratum a broad layer, up to 200μ thick, with hyphae densely longitudinally arranged, 2μ in diameter, concolorous with the fructification, which ascend, without forming pillars, as (2) the loosely arranged middle layer, whose hyphae pass into and form (3) the hymenial crust which is finally very dense and compact in fully developed specimens, about 200μ thick, with hyphae concolorous, even, 1½–2μ in diameter, branching towards the surface into flexuous branches, or paraphyses, about 1μ in diameter, once or twice dichotomously branched and with tips curved or spirally coiled; probasidia borne laterally on the hyphae, hyaline, pyriform, 9 × 5½μ, becoming elongated and septate as a few-celled, spore-bearing organ, or producing directly a sterigma bearing one spore; spores hyaline, even, cylindric, nearly straight, 13–17 × 4–5μ.

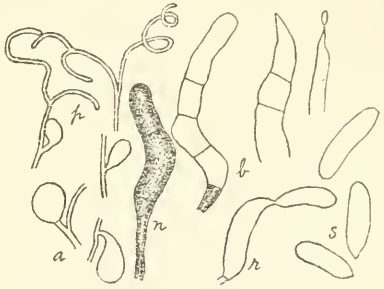

Fig. 9

S. frustulosum.

a, probasidia; *b*, three spore-bearing organs; *n*, septate colored organ; *p*, paraphyses; *r*, probasidium bearing a spore; *s*, spores. × 640.

Fructifications up to 10 cm. long, 1–2 cm. broad, less than 1 mm. thick.

On bark of living limbs of frondose species. Mexico, West Indies, and Venezuela. February, March, November; spore-bearing in November.

This species is highly distinguished by honey-yellow color and the division of its fructification into narrow, sinuous, branched divisions, resembling those of the thallus of the lichens, *Physcia stellaris* and *P. obscura*. Spore-bearing organs are not abundant in the only fertile specimen which I have seen. They appear to become somewhat cork-screw-shaped, with no indication of bearing spores except on the terminal cell, but I was not certain on this point because the occasional attached spores were along the edge of thick sections where only the apex of the organ extended beyond the paraphyses. In two cases probasidia were bearing at the apex, each a body of the form and dimensions of a spore of this species. In the deeper portions of the fructifications brown, pyriform bodies of the same size and form as the probasidia are borne by the hyphae in the same location as the probasidia. These brown organs are often of the same dimensions as the spore-bearing organs, septate, and gorged with brown contents.

Specimens examined:

Exsiccati: Smith, Cent. Am. Fungi, 100, under the name *Thelephora retiformis*.

Mexico: Sanborn, Oaxaca, *C. R. Orcutt, 3334* (in Mo. Bot. Gard. Herb.).

Nicaragua: Castillo Viejo, *C. L. Smith,* in Smith, Cent. Am. Fungi, 100.

Cuba: *C. Wright, 244,* cotype (in Curtis Herb.).

Grenada: Grand Etang, *R. Thaxter,* comm. by W. G. Farlow, 11.

Venezuela: *Fendler, 279* (in Farlow Herb. and in Mo. Bot. Gard. Herb., 20411).

13. S. retiforme (Berk. & Curtis) Patouillard, Soc. Myc. Fr. Bul. **16**: 55. 1900.

Thelephora retiformis Berk. & Curtis, Linn. Soc. Bot. Jour. **10**:330. 1868; Sacc. Syll. Fung. **6**:544. 1888.

Type: type and cotype in Kew Herb. and Curtis Herb.

Fructification resupinate, effused, coriaceous, at first drab or Prout's brown, then Chaetura-drab, the hymenial surface reticulated with obtuse veins, pulverulent; in structure 700μ thick, with the hyphae colored, 3–4μ in diameter, short-celled, loosely interwoven or rising obliquely from substratum to hymenial surface and there densely interwoven longitudinally and bearing laterally brown, globose or pyriform bodies 13–15 $\times$ 10–13μ, and slightly colored probasidia of the same size and form; a single spore in the hymenial surface is hyaline, even, curved, 15 $\times$ 4μ; no spore-bearing organs found.

Fig. 10 S. retiforme. *a*, probasidium; *n*, colored organ; *s*, spore. $\times$ 640.

Fructification 1–4 cm. long, about 700μ thick.

On living branches of apple, pear, peach, *Carya*. District of Columbia to Louisiana and Cuba. November to February, producing probasidia in February.

S. retiforme resembles a small foliaceous lichen in habit. It may be distinguished from our other species by its drab to brown color and reticulately veined hymenial surface. The spore characters stated are uncertain for only one spore was seen.

Specimens examined:

Exsiccati: Ellis & Ev., N. Am. Fungi, 2604.

District of Columbia: Washington, comm. by Mrs. F. W. Patterson.

Georgia: Fort Valley, comm. by Mrs. F. W. Patterson.

Alabama: Forestdale, *C. C. Woodward*, comm. by J. B. Rorer; Abbeville, *S. T. Slaton* (also in Lloyd Herb., 3460, and in Mo. Bot. Gard. Herb., 5166).

Louisiana: St. Martinville, *A. B. Langlois, 2233.*

Cuba: *C. Wright, 288,* cotype (in Curtis Herb.).

14. S. Spongia (Berk. & Curtis) Patouillard, Soc. Myc. Fr. Bul. **16**:181. 1900.

Thelephora Spongia Berk. & Curtis, Linn. Soc. Bot. Jour. **10**:330. 1868; Sacc. Syll. Fung. **6**:542. 1888.

Type: type and cotype in Kew Herb. and Curtis Herb.

Fructification resupinate, effused, not separable from the substratum, dry, glabrous, shining, between mouse-gray and hair-brown, the margin strigose; in structure lacunose, spongy, about 1 mm. thick when dry, distending to 1½–2 mm. when moistened, with hyphae 3–3½μ in diameter, fuscous to clove-brown under the microscope, densely longitudinally arranged in masses along the substratum and rising obliquely so as to form a spongy structure with vacant spaces up to 800 × 500μ, united above into a continuous hymenial crust 40–80μ thick; probasidia, spores, and spore-bearing organs not present.

Fig. 11 S. Spongia. Vertical section of fructification showing spongy structure. × 9.

Fructification "spreading for many inches," 1½–2 mm. thick.

On bark of cacao trees. Cuba.

S. Spongia is distinguished from our other species in the group having a glabrous hymenial crust by the spongy, rather than pillared, structure of the middle region of the fructification. The surface of the cotype is infested with a colorless hyphomycete whose hyphae are densely crowded together and agglutinated; hence fertile specimens of this species will probably be browner than the original sterile, infested specimen.

Specimens examined:

Cuba: *C. Wright, 566,* cotype (in Curtis Herb., and a portion in Mo. Bot. Gard. Herb., 44592, by kindness of Dr. Farlow).

? Mexico: Monterey, Sierra Madre, *C. G. Pringle,* comm. by W. G. Farlow, 6 (in Mo. Bot. Gard. Herb., 44591).

15. S. fumigatum Burt, n. sp.

Type: in Mo. Bot. Gard. Herb. and Humphrey Herb.

Fructification resupinate, long and broadly effused, not separable from substratum, coriaceous, tomentose, between mouse-gray and hair-brown, rarely with surface pale, the margin thinning out and concolorous; in structure 800–1500μ thick, with hyphae buffy brown under the microscope, even, thick-walled, 4μ in diameter, loosely interwoven and ascend-

ing from substratum to hymenial region; in the hymenial region the hyphae become more densely interwoven and bear laterally numerous hyaline, subglobose probasidia 12–15μ in diameter, and terminate in small, curved or loosely coiled, colored branches—hardly paraphyses—2μ in diameter, which form the surface of the hymenium; spores simple, hyaline, even, slightly curved, 12–15 $\times$ 5–6μ, borne on the upper three cells of a few-celled, nearly straight, hyaline, spore-bearing organ 40–50 $\times$ 6–7½μ, into which the probasidium develops.

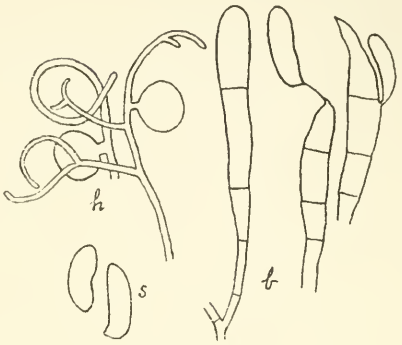

Fig. 12
S. fumigatum.
h, portion of hymenium showing hyphae bearing probasidia and terminating in curved and coiled ends; *b*, three spore-bearing organs; *s*, spores. $\times$ 640.

Up to 5 m. long, several cm. broad, ⅘–1½ mm. thick.

On trunks of living sapling of *Acer rubrum* and probably other species. South Carolina, Alabama, and Cuba. November to May; spores most numerous in May.

S. fumigatum has the general habit and color of *Hypochnus spongiosus* and is readily distinguishable among the North American species of *Septobasidium* by its mouse-gray color, tomentose surface, and felty structure of loosely interwoven hyphae which do not form pillars. It is only rarely that I have seen spores or evidences of spore production upon other than the terminal cell in this species.

Specimens examined:

South Carolina: Gourdin, *C. J. Humphrey, 2588,* type (in Mo. Bot. Gard. Herb., 43822).

Alabama: Montgomery, *R. P. Burke, 50,* and an *unnumbered collection* (in Mo. Bot. Gard. Herb., 11382, 20068).

Cuba: *C. Wright,* Fungi Cubenses Wrightiani, 838, comm. by W. G. Farlow (in Farlow Herb. and Mo. Bot. Gard. Herb., 43907).

16. **S. canescens** Burt, n. sp.

Type: in Mo. Bot. Gard. Herb.

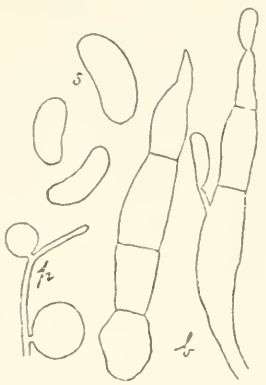

Fig. 13
S. canescens.
p, hypha in hymenial surface bearing probasidia; *b*, two spore-bearing organs; *s*, spores. × 640.

Fructification resupinate, effused, coriaceous, cottony, pubescent, white at first, pale olive-buff in the herbarium, the margin thinning out; in structure 500–900μ thick, with the hyphae hyaline, even, 4½μ in diameter, densely interwoven next to the substratum, suberect, or ascending obliquely and loosely interwoven to the hymenial surface and there bearing probasidia laterally among slightly curved hyphal branches about 2μ in diameter; probasidia hyaline, subglobose, 15–17μ in diameter, producing a few-celled organ 7½μ in diameter, up to 60μ long, which bears spores on its upper three cells; spores simple, hyaline, even, curved, 15–20 × 5½–6μ.

Fructifications about 2–4 cm. long, 1–1½ cm. broad, sometimes arranged more or less interruptedly for up to 25 cm. along the under side of limbs.

Associated fairly constantly with scale insects on small living branches of *Quercus* on a residence street, Pasadena, California. November to March.

S. canescens is characterized by its white to whitish color, cottony structure, and pubescent surface. Spores were observed attached to one or more of the upper three cells of the spore-bearing organ but with the terminal cell giving the most indication of spore production. I am indebted to Prof. H. S. Fawcett for the collection made in March to show this species in best fruiting condition.

Specimens examined:

California: Pasadena, *H. S. Fawcett,* comm. by W. A. Setchell (in Mo. Bot. Gard. Herb., 44037); same locality, *A. G. Smith,* comm. by H. S. Fawcett (in Mo. Bot. Gard. Herb., 44246).

17. S. lilacinum Burt, n. sp.

Type: in Farlow Herb. and Burt Herb.

Fructification resupinate, effused, coriaceous, dry, adnate, velutinous, between lilac-gray and pallid smoke-gray, the margin adnate, fimbriate; in structure 80–200μ thick, with hyphae thin-walled, 2–2½μ in diameter, somewhat colored near the substratum, ascending and interwoven and becoming hyaline towards the hymenium, finer, 1½μ in diameter, and bearing laterally probasidia, and extending beyond the probasidia and branching, with tips curved to form the velvety surface of the hymenium; probasidia hyaline, even, globose, up to 9μ in diameter; spores simple, hyaline, even, slightly curved, 11–13 × 3½–4½μ, borne on a few-celled, spore-bearing organ about 20–30 × 4–5μ, slightly curved at first.

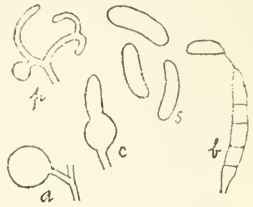

Fig. 14

S. lilacinum.

p, hyaline portion of hypha in hymenial surface bearing a probasidium; *a*, mature probasidium; *c*, probasidium with young spore-bearing organ; *b*, spore-bearing organ; *s*, spores. × 640.

Fructifications more than 6 cm. long, more than 1½ cm. wide.

On bark, Maravals, Trinidad, West Indies.

This species is characterized by its very thin, velvety fructification, pallid smoke-gray with a slight lilac tint, fine hyphae, and small probasidia, spore-bearing organs, and spores. The spore-bearing organs were slightly curved in all cases where spores were attached to them; in the sections some of these organs appeared strongly curved or hook-shaped but my preparations did not demonstrate this point positively, for the numerous curved hyphal branches were confusing.

Specimens examined:

Trinidad: Maravals, *R. Thaxter,* comm. by W. G. Farlow, 28, type.

(To be continued.)